ENVIRONMENTAL STRATEGIES CORPORATION

FEASIBILITY STUDY

Walker Property Site
Santa Fe Springs, California

Prepared by:

Environmental Strategies Corporation
333 N. Glenoaks Boulevard
Burbank, California

Prepared for:

Texaco Inc.
10 Universal City Plaza
Universal City, California

Submitted to:

California Department of Toxic Substances Control
Site Mitigation Branch - Region 3
Glendale, California

ESC

April 1, 1996

REV. 7/8/96

7/23/96

July 16, 1996

ENV -STUDIES, SURVEYS & REPORTS
~~Final Feasibility Study~~
Walker Property
Santa Fe Springs, ~~CA~~
Location No: 80-200-0061

DTSC

Mr. Hamid Saebfar
California Environmental Protection Agency
Department of Toxic Substances Control
Site Mitigation Branch
1011 North Grandview Avenue
Glendale, CA 91201

Attention: Walker Properties Project Officer

Dear Mr. Saebfar:

Enclosed is the final Feasibility Study for the Walker Property, in Santa Fe Springs, CA. The DTSC's comments on the draft Feasibility Study have been incorporated into the final Feasibility Study. Texaco plans to begin preparation of the Remedial Action Plan upon written approval of the Feasibility Study.

If you have any questions please do not hesitate to call me at (818) 505-2738.

Sincerely,

Jeffery W. Johnson

Jeff W. Johnson
Project Engineer
TRMI - Environment Health & Safety

JWJ:jkf
p:\jwj\walker\fs0796.doc

Enclosure

PR: FL

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APPENDIX

ACRONYMS AND ABBREVIATIONS

ACM	Asbestos containing material
AGST	Above ground storage tank
ARAR	Applicable or Relevant and Appropriate Requirements
BHRA	Baseline Health Risk Assessment
BTEX	Benzene, toluene, ethylbenzene, xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cy	Cubic yards
DTSC	Department of Toxic Substances Control
EPA	Environmental Protection Agency
FS	Feasibility Study
HSAA	California Hazardous Substances Account Act
HWCL	California Hazardous Waste Control Law
MCL	Maximum contaminant level
NCP	National Contingency Plan
O&M	Operations and Maintenance
PAH	Poly-aromatic hydrocarbon
PCB	Polychlorinated biphenyl
RAP	Remedial Action Plan
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RWQCB	Regional Water Quality Control Board
SCAQMD	South Coast Air Quality Management District
VOC	Volatile organic compound
µg/dL	Micrograms per deciliter

FEASIBILITY STUDY

Walker Property Site
Santa Fe Springs, California

EXECUTIVE SUMMARY

The Walker Property Site (the Site), located at the southeastern corner of Bloomfield Avenue and Lakeland Road in Santa Fe Springs, California, is a 21.32-acre property that has been owned and/or operated by a number of different entities since the 1920s. The property has been used for, among other things, storage of crude oil, refined product, and waste oil, and storage/disposal of oil-well drilling fluids.

This feasibility study (FS) has been prepared on behalf of Texaco Inc. (Texaco). Texaco is the only Potentially Responsible Party (PRP) responding to the First Amended Imminent or Substantial Endangerment Order and Remedial Action Order (the Order), effective October 26, 1992, issued by the California Environmental Protection Agency (Cal-EPA) Department of Toxic Substances Control (DTSC) regarding the Walker Property Site. The Order identified two distinct areas at the site: the Lakewood Section on the west side of the Site, and the Railroad Section on the east side of the Site. Other portions of the Site were not included in the Order.

Several removal actions have been completed at the Site. Drum removal activities were conducted at the Site in 1993. Waste was removed from four above ground storage tanks and the tanks were decommissioned between December 1993 and January 1994, in response to a request by the DTSC. Additionally, in 1994, an abatement of asbestos containing material was completed at the Site.

This FS presents an evaluation of the alternatives for remediation of soils containing PCBs at the Site. A remedial investigation (RI) and a Baseline Health Risk Assessment (BHRA) were completed in 1995 (HLA, 1995, Vols. I-IV). Based on the findings of the RI and the BHRA, site activities have not impacted groundwater beneath the Site, and compounds detected in groundwater samples collected on-site appear to be part of a regional groundwater contamination problem. Based on the RI, the chemicals of concern in soil at the Site include polychlorinated biphenyls (PCBs), petroleum hydrocarbons, volatile organic compounds (VOCs), lead, and barium. Over 90 percent of the estimated future on-site cancer risk is associated with the presence of PCBs. The BHRA established that the potential health impacts, both carcinogenic and non-carcinogenic, associated with the low concentrations of contaminants detected in soils at the Site are all below the levels of concern established by the regulatory agencies.

The potential for future impact to groundwater from the presence of low concentrations of contaminants in shallow soils was evaluated as part of the BHRA using a vadose zone flow and transport model and a groundwater mixing model. The results of this evaluation indicate that, under the most conservative scenario (using maximum soil concentrations), most contaminants, including PCBs, would not reach groundwater. Only VOCs were predicted to reach groundwater. However, under that conservative scenario, VOCs were predicted to reach groundwater within several years in the low part-per-trillion concentrations. Such low concentrations are not expected to degrade groundwater. The resulting groundwater concentrations using average soil concentrations would be significantly lower. Therefore, soil contaminants at the Site are not expected to degrade groundwater quality underlying the Site.

The remedial action objectives formulated for the Site are the following:

- To reduce human health risks;
- To reduce potential migration of PCBs; and
- To maintain groundwater quality consistent with its designated use.

This FS was prepared in accordance with the Order, the Hazardous Substances Account Act (HSAA) the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The following alternatives were formulated and screened against the criteria of implementability, effectiveness, and cost: no further action, surface controls, chemical fixation, solvent extraction, soil washing, in-situ bioremediation, in-situ vitrification, infrared desorption, incineration, off-site disposal, and partial excavation and off-site disposition with on-site surface controls. Three alternatives were selected for further evaluation based upon that screening:

- Alternative 2: Surface controls;
- Alternative 3: Chemical fixation; and
- Alternative 9: Partial excavation and off-site disposition with on-site surface controls.

These three alternatives were evaluated using the seven applicable NCP criteria. The results of the evaluation indicate that three alternatives (Alternatives 2, 3, and 9) adequately protected human health and the environment. However, Alternative 2 was favored over Alternative 3, because the implementability of Alternative 3 would need to be verified through a treatability study. Alternative 2 was favored over Alternatives 3 and 9 because of its cost-effectiveness. The cost for Alternatives 3 and 9 is greater than the cost for Alternative 2 by a factor of approximately 3 and a factor of approximately 9, respectively. Additionally, the cost for Alternative 3 may be significantly increased in the event that regulatory approval for on-site backfilling using the treated material is not obtained. The total estimated cost for the recommended alternative (Alternative 2) is approximately $60,000 to $80,000.

Although Alternative 2, surface controls, appears to be the most suitable alternative for remediation of soils at the Site, final selection and implementation of a remedy will be detailed in a remedial action plan for the Site once this FS has been accepted by the DTSC. The selected remedy will be evaluated pursuant to the statutory requirements identified in the Hazardous Substances Account Act (HSAA) Section 25356.1 for the preparation and issuance of an acceptable remedial action plan.

1.0 INTRODUCTION

This FS has been prepared on behalf of Texaco Inc. (Texaco). Texaco is the only Potentially Responsible Party (PRP) responding to the First Amended Imminent or Substantial Endangerment Order and Remedial Action Order (the Order), effective October 26, 1992, issued by the California Environmental Protection Agency (Cal-EPA) Department of Toxic Substances Control (DTSC).

This FS was prepared in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), Hazardous Substances Account Act (HSAA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This FS presents an evaluation of the alternatives for remediation of soils at the Site. A remedial investigation (RI) and a Baseline Health Risk Assessment (BHRA) were completed in 1995 (HLA, 1995, Vols. I-IV). Site characterization data used as the basis for the FS were obtained from the RI and the BHRA.

1.1 BACKGROUND INFORMATION

1.1.1 Site Description

The Site is located at the southeastern corner of the intersection of Bloomfield Avenue and Lakeland Road in the city of Santa Fe Springs, California (Figure 1). The assessor's parcel number is 8026-001-042. The fenced Site occupies approximately 21.32 acres and is bounded by Lakeland Road on the north; an Atchison, Topeka, and Santa Fe Railroad right-of-way on the east; Bloomfield Avenue on the west; and the Kelly Pipe Company property on the south. The Site is bordered by an industrial area to the north, east, and south. Metropolitan State Hospital is directly across Bloomfield Avenue to the west, in the city of Norwalk. A portion of the Powerine Oil Company (Powerine) refinery is located to the northwest across Lakeland Road. The nearest schools and residential areas are ¼-mile east of the Site.

The Site is currently unoccupied, except for the Balboa Pacific Corporation (Balboa), which designs and constructs industrial wastewater treatment systems, (Figure 2). The Balboa operations include a materials storage/fabrication yard. Little remains of previous facilities that operated on many different areas of the property. Balboa, which designs and constructs industrial wastewater treatment systems, is the only current tenant of the Site. The Balboa operations include a materials storage/fabrication yard. The Lakewood and Railroad Sections identified in the Order are currently unoccupied.

Miscellaneous piping and the remains of an earthen-berm/concrete-wall retention dike remain in the vicinity of the above ground tanks previously located in t the northwest corner of the Site (Lakewood Section). An abandoned railroad spur lies along the eastern portion of the property. Although the spur is still in place, it does not connect to the main line east of the Site.

1.1.2 Site History

The Site, which is currently owned by Mr. and Mrs. George Walker (Walker), has been owned and/or operated by a number of different entities. The property has been used for, among other things, storage of crude oil, refined product and waste oil, and storage/disposal of oil-well drilling fluids. A detailed discussion of Site history and operations is presented in the RI report. The Order identified two distinct areas at the site: the Lakewood Section on the west side of the Site, and the Railroad Section on the east side of the Site. Other portions of the Site were not included in the Order.

1.1.3 Summary of Previous Studies

A preliminary endangerment assessment (PEA) report (TRC, 1990h; cited in HLA, 1995) was prepared for Walker and its agent, Turner Development Corporation (Turner), in 1990. The PEA was the first remedial planning step required by the DTSC for environmental cleanup of the Site. The PEA report summarizes past and current activities at the Site, particularly with respect to the management of hazardous wastes on the property. The results of 17 previous site investigations, prepared by four different consultants during the period from 1985 through 1990, are discussed in the PEA report. The previous site investigations were performed to assess the possible presence, nature, and extent of hazardous substances on the Site. The PEA report indicated that subsurface conditions at the Site had been investigated by means of the following:

- Ninety soil borings (119-foot maximum depth);
- Six groundwater monitoring wells (130-foot maximum depth);
- Forty-six exploration trenches (less than 10 feet deep);
- Forty-one soil-gas probes (typically 3 feet deep);
- Sixteen soil-gas monitoring wells (11 to 25 feet deep);
- Eighteen soil samples from tank and pipeline excavations; and
- Three asbestos samples from surface facilities.

The PEA established that Site soils primarily contained concentrations of petroleum hydrocarbons, including waste oils, jet fuel, diesel fuel, and a limited amount of gasoline. Additional contaminants found at the Site included PCBs, lead, barium, copper, and asbestos. Groundwater samples from on-site monitoring wells contained concentrations of petroleum hydrocarbons and some organic solvents. The highest concentrations were in the upgradient well, and were attributed to off-site sources. Subsequent to the PEA report, two quarterly groundwater monitoring reports were prepared by TRC for Walker/Turner (TRC, 1990g and 1990l; cited in HLA, 1995).

Data summaries corresponding to the previous site investigations performed at the Site are provided in the RI.

1.1.4 Summary of Previous Remedial Activities

Removal actions that have taken place at the Site on Texaco's behalf include drum removal, above ground tank cleaning and water disposal, above ground tank decommissioning and removal, and abatement of asbestos containing material (ACM) (HLA, 1995). The RI presents summaries of the analytical data associated with these removal actions.

In May 1993, drum removal activities were conducted in which drums containing wastes generated during previous site investigations were characterized, classified, manifested, and properly disposed. In December 1993 through January 1994, four aboveground storage tanks (AGST), located in the northern part of the Lakewood Section were emptied, decontaminated, and removed from the Site. Finally in March of 1994, asbestos containing materials (ACM) and asbestos impacted soils, identified during previous investigations, were removed from the site and properly disposed of. All ACM and soils identified as being asbestos-impacted were removed and transported from the Site for proper disposal.

1.2 SUMMARY OF REMEDIAL INVESTIGATION

The Remedial Investigation (HLA, 1995) was conducted to achieve five main objectives:

- Assess the nature and extent of chemicals of concern, if any, in soil, surface water/sediment, and groundwater at the Site or in off-site areas affected by previous activities at the Site;
- Identify existing and potential migration pathways including the direction and rate of chemical migration;
- Assess the magnitude and probability of actual or potential harm to public health, safety, or welfare, or to the environment, posed by the potential release of chemicals at the site;
- Identify and evaluate appropriate remedial measures to prevent migration of future releases and mitigate any releases that already occurred; and
- Collect and evaluate the information to prepare a remedial action plan in accordance with established regulatory guidelines, if necessary.

The RI included an aerial photograph review, ambient air monitoring, drilling of 27 soil borings and a groundwater monitoring well, and collection and analysis of surface and subsurface soil and groundwater samples. All field work was performed under the direct oversight of a registered geologist. Analytical testing of air, soil, and groundwater samples was performed by a State-certified laboratory.

Soil samples were analyzed for PCBs, lead, barium, volatile and semivolatile organic compounds including benzene, toluene, ethylbenzene, and xylenes (BTEX) as well as polynuclear aromatics (PNAs), and petroleum hydrocarbons. Selected samples impacted by petroleum hydrocarbon were "fingerprinted" using detailed gas chromatography/mass spectrometer techniques to identify the nature of the petroleum.

One additional groundwater monitoring well was installed on the southern, downgradient portion of the Site. This well, together with five pre-existing monitoring wells were sampled to assess groundwater quality. Groundwater samples were analyzed for volatile organic compounds (VOCs), petroleum hydrocarbons, and general and trace minerals.

The RI identified the presence of PCBs, lead, and petroleum hydrocarbons in the vadose zone soils. PCBs and non-background levels of lead detected in the soil appear to be limited in their areal extent to the immediate vicinity of the former AGSTs in the northern part of the Lakewood Section. Soils containing PCBs are localized and relatively shallow. PCB concentrations decrease significantly with depth and do not extend deeper than approximately 15 feet below ground surface (bgs). Petroleum hydrocarbons were detected in the soil in both the Lakewood and Railroad Sections. In the Lakewood Section, petroleum hydrocarbons are generally limited to the near surface zone (0 to 5 feet bgs) and are located in only a few discrete, isolated areas. These areas are close to sites of former AGSTs or underground storage tanks. In the Railroad Section, the shallow soils used as fill in the former drainage area appear to contain low concentrations of highly degraded crude oil with little or no volatile BTEX or semivolatile PNA compounds present. Figure 3 presents the PCB distribution in soils at the Site.

Areas where petroleum hydrocarbons were detected at depth are limited to former sump and ponding zones in the southern part of the Railroad Section, and do not extend below 30 feet bgs. An isolated zone of soil containing a light, refined petroleum product, possibly gasoline, was detected in the extreme northeast corner of the Railroad Section. Based on aerial photograph review and known Site history, this area does not appear to have been impacted by Site activities; rather the source appears to be located off-site, possibly refined product pipelines which are owned by others and are located beneath Lakeland Road.

Groundwater at the Site does not appear to have been impacted by any Site activity. Liquid hydrocarbon product and elevated concentration of VOCs, including some halogenated organics, were identified in upgradient wells. The concentrations were found to decrease going downgradient across the Site with no VOCs or compounds in on-site soils being detected downgradient of the former sump and ponding areas. Off-site contaminant plumes and off-site sources are known to exist both upgradient and crossgradient of the Site, and most likely are the source of the compounds detected in the Site wells.

Based on the results from the RI and from the associated BHRA, which are further discussed in Section 1.4, the following conclusions were reached:

- All the objectives and requirements set forth in the Order with respect to site assessment have been met. The extent of soils containing PCBs, lead, barium, and petroleum hydrocarbons has been adequately assessed and requires no further investigation. No evidence exists from historic aerial photograph reviews, known site history, or soil investigations conducted on-site that Site activities have impacted groundwater. In addition, VLEACH modelling of site conditions indicates that the current levels of chemicals in the Site soil do not pose a significant threat to groundwater beneath the Site.

- To further reduce risks associated with the presence of PCBs, it was recommended that a focused feasibility study be conducted for the zone of PCBs encountered in the northern part of the Lakewood Section.

- Because of the negligible risks associated with the lead, barium, and petroleum hydrocarbons detected on-site, no additional actions are recommended regarding those chemicals of concern.

1.3 SUMMARY OF BASELINE HEALTH RISK ASSESSMENT

A baseline health risk assessment was conducted for the Site to evaluate the potential human health risks associated with exposure to Site-related chemicals. The assessment was prepared in accordance with EPA and Cal-EPA risk assessment guidelines. Twenty-nine chemicals of concern were quantitatively evaluated in the risk assessment. These included PCBs, PAHs, volatile chlorinated hydrocarbons, and metals.

Chemical exposures to current and potential future on-site workers ("occupational receptors") were evaluated in the risk assessment. The complete exposure pathways evaluated for these receptors were soil ingestion, dermal contact with soil, inhalation of vapors, and inhalation of suspended particulates. Soil leaching potential was evaluated for all relevant chemicals to assess the potential migration of chemicals in site soils to groundwater. Off-site populations were not quantitatively evaluated because the estimated cancer risk and noncancer hazard associated with inhalation were below levels of concern.

As indicated in Section 1.1.1 of this FS, currently there are no on-site workers in the Lakewood and Railroad Sections of the Site. The references to current on-site workers presented in the BHRA (HLA, 1995) correspond to the workers at the Balboa facility, the only current tenant at the Walker Property Site. Balboa's operations are located in the southwest portion of the site, and are outside the current regulatory order.

The 95 percent confidence limit on the mean soil concentration (or maximum soil concentration) was used to conservatively evaluate exposure concentrations in soil and suspended dust, and as input data for vapor emission estimates. Suggested regulatory default values for exposure parameters for a worker were used to assess chemical uptake for a "reasonable maximum exposure" (RME) scenario. Additionally, scientifically defensible average exposure parameters values were used to evaluate a "most likely" (i.e. average) worker exposure scenario.

The total noncancer hazard index (ratio of site-related exposure to acceptable exposure) for all chemicals and all exposure pathways was significantly less than 1.0 for the future occupational receptor under the reasonable maximum exposure (RME) scenario. According to the EPA (1989), because the Hazard Index for evaluation of all chemicals and all toxicological endpoints is less than unity (1.0), there is not a concern for potential chronic adverse health effects at the Site for future occupational populations. As the current on-site occupational receptors are only exposed to site-related soil chemicals via the inhalation exposure, the Hazard Index associated with their potential exposures is significantly lower than that of the future occupational receptor.

The estimated increased cancer risk is 9×10^{-6} (nine in one million) for the future occupational receptor under the RME scenario. Using more realistic exposure parameters for the future occupational receptor results in an estimated cancer risk of 4×10^{-7} (four in ten-million). For the RME scenario, exposure to PCBs contributed to approximately 96 percent of the cancer risk. In the average exposure scenario, exposure to PCBs contributed approximately 64 percent of the cancer risk.

The estimated cancer risk associated with the current on-site worker, based on inhalation of particulates and vapors, is 3×10^{-7} using RME assumptions. Because the estimated cancer risks are within the range of risk that has typically been considered "insignificant" for worker populations at both the State and Federal level, it may be concluded that future occupational use of the Site does not pose a significant increased cancer risk under the set of conditions described in the risk assessment.

Potential health impacts from exposure to lead were evaluated using the "LEAD SPREAD" model of the California Department of Toxic Substances Control (DTSC, 1992). This model provides a method for estimating distribution of blood-lead levels in a population exposed to lead from impacted soils and other sources (e.g., diet). DTSC guidance suggests that the blood lead concentration of concern is 10 micrograms per deciliter (10 μg/dL) of whole blood, and the point of departure for risk management is a 1 percent risk of exceeding this value. The results of the model for adult exposure at the Site indicate that the predicted blood-lead level was significantly below the level of concern of 10 μg/dL at the one-percent risk level. Therefore, the presence of lead in soil at the Site does not pose a health risk for future occupational receptors.

In summary, the results from the BHRA indicate that:

- The estimated cancer risk for the future occupational receptor was 9×10^{-6} (nine in one million) under the RME scenario, and 4×10^{-7} (four in ten million) for the average scenario.

- Under the RME scenario, exposure to PCBs contributed to approximately 96 percent of the cancer risk.

- Results of the Lead Spread analysis indicate that lead levels in Site soils are well below those that would lead to unacceptable blood lead levels.

- Noncancer health risks associated with barium are negligible.

- Petroleum hydrocarbons detected in the Lakewood and Railroad Sections are generally highly degraded with little or no BTEX or PNA content.

- Risks associated with petroleum hydrocarbons detected in the Lakewood and Railroad Sections are negligible.

Based on these results, the following conclusions were reached:

- Because the estimated cancer risks are within the range of risk that has typically been considered "insignificant" for worker populations at both the State and Federal level, and because noncancer health hazards associated with chemicals detected in soils at the Site are negligible, it may be concluded that future occupational use of the Site does not pose a significant increased cancer risk or other health risk under the set of conditions described in the BHRA.

- The leaching potential analysis indicates that current levels of chemicals in Site soils do not pose a threat to groundwater underlying the site.

To further reduce risks associated with the presence of PCBs, the BHRA recommended that a focused feasibility study be conducted for the localized areas where PCBs were encountered in the northern part of the Lakewood Section.

Because of the negligible risks associated with the lead, barium, and petroleum hydrocarbons detected on Site, no additional actions were recommended.

1.4 FEASIBILITY STUDY APPROACH

This FS is being conducted to formulate and evaluate remedial alternatives responsive to the Site-specific remediation needs. The need for and extent of soil remediation required at the Site has been assessed based on potential human health risks and an evaluation of potential degradation of groundwater quality due to the presence of the Site soils. This FS has been conducted pursuant to the statutory requirements of the HSAA to evaluate potential remedial action alternatives and select a remedy for the Site.

Section 25350 of the HSAA requires that remedial alternatives be developed consistent with the guidelines presented in the NCP. As such, several steps have been followed in conducting this FS:

- Identify and define the media potentially requiring remediation;

- Establish remedial action objectives and list general response actions meeting the remediation objectives:

- Identify, screen, and evaluate remedial technologies and process options based on a preliminary evaluation of effectiveness, implementability and relative cost;

- Formulate remedial action alternatives from the process options advancing from the technology evaluations;

- Screen the remedial action alternatives based on a detailed evaluation of effectiveness, implementability, and cost;

- Complete an individual and comparative detailed evaluation of the alternatives advancing from the alternatives screening step based on the following seven criteria:

    1) Overall protection of human health and the environment;
    2) Compliance with ARARs;
    3) Long-term effectiveness and permanence;
    4) Reduction of toxicity, mobility, or volume through treatment;
    5) Short-term effectiveness;
    6) Implementability; and
    7) Cost.

- Pursuant to the NCP, two additional criteria will be considered following public release of a draft remedial action plan (RAP), and before a definite remedy for the Site is selected. Those additional criteria are:

    1) Agency preference; and
    2) Community acceptance.

Based on the above screening and evaluation process, the remedial action alternatives evaluated in the FS will be used to select a remedy and prepare a RAP for the Site. The selected remedy will be evaluated pursuant to the statutory requirements identified in HSAA Section 25356.1 for the preparation and issuance of an acceptable RAP.

2.0 MEDIA EVALUATION AND TECHNOLOGY SCREENING

The need for remediation of groundwater beneath the Site and of soils at the Site has been appraised based on potential health risks associated with exposure to the soils, potential migration of PCBs from the shallow soils to the groundwater, and current groundwater quality and beneficial uses. Remedial action objectives responsive to the site-specific needs for remediation have been established. Remedial technologies and process options that can be applied to realize the remedial action objectives have been identified and screened in this section. This section presents the results of the technology screening conducted for the Site. The selected technologies have been evaluated as remediation alternatives in Section 3.0.

2.1 GROUNDWATER MEDIUM

This section briefly describes the current groundwater quality at the Site and the results of an evaluation to determine the potential for low concentrations of contaminants present in the shallow soils at the Site to degrade the groundwater quality. As described in detail in the RI report, the compounds detected in the samples of groundwater collected on-site appear to be part of a regional groundwater contamination problem.

2.1.1 Groundwater Quality

Depth to groundwater at the Site ranges from 85 feet (Powerine Refinery) to 100 feet (northeastern corner of the Site) to 107 feet (southwestern corner of the Site). Saturated thickness within the Exposition aquifer ranges from 20 feet (Powerine Refinery) to 0 feet (southwestern corner of Site) under unconfined conditions. Slug and pump tests performed as part of previous investigations were interpreted to indicate a highly heterogeneous aquifer containing significant boundary effects, as reported in the RI. The direction of groundwater flow is to the south-southwest.

The site is located in an area of historically heavy industrial activity and, as a consequence, at least 102 properties and businesses within an approximately 1-mile radius of the Site have been identified on one or more environmental regulatory lists, such as the National Priorities List, CERCLIS, Cortese List, or ASPIS. A number of these properties, several of which are close to and upgradient of the Site, have documented groundwater contamination problems that involve petroleum hydrocarbons and/or organic solvents.

Groundwater results from the RI indicate that the groundwater beneath the Site is impacted primarily with BTEX compounds, which are constituents of gasoline fuels. The maximum concentration of benzene is found at the northern portion of the Site and decreases in concentration from 660 ppb to less than 1 ppb downgradient across the property. It should be noted that there were no indications of BTEX in soil during the subsurface soil investigation except at depth in Boring RS-1 in the northeast corner of the Site, where BTEX is known to exist.

The RI's groundwater investigation and review of available information indicate that the BTEX and chlorinated VOCs observed intermittently in the groundwater are derived from off-site sources based on the known upgradient groundwater contamination and groundwater flow direction. No evidence was found that any chlorinated VOCs, such as vinyl chloride, DCA, or DCE, have ever been used or stored on the Site. As described in the RI, at least two industrial properties located in the vicinity of the Site, have reported significant concentrations of chlorinated VOCs such as vinyl chloride, DCA, TCA, TCE, PCE and DCE. These contaminants appear to be part of a regional groundwater contamination problem with sources upgradient of the Walker Site.

2.1.2 Groundwater Contaminant Transport

Based on the results of the RI, no evidence exists from historical aerial photograph reviews, known Site history, or soil investigations conducted on-site that Site activities have impacted groundwater. In addition, VLEACH modeling of Site conditions, which is further described in Section 2.2.2 of this FS, indicates that the current levels of chemicals in the Site soil do not pose a groundwater threat.

2.2 SOILS MEDIUM

This section briefly describes the physical characteristics of soils at the Site and the results of an evaluation to determine if the low concentrations of contaminants present in the shallow soils at the Site could potentially leach from the soils, reach the groundwater, and degrade the groundwater quality.

2.2.1 Physical Characteristics of Soils

Native soils are found at the surface on the western half of the Site, including the Lakewood Section. Artificial fills cover most of the eastern half of the Site, including the Railroad Section. Original grades at the Site consisted of a relatively flat area on the western portion of the Site at an elevation of approximately 140 feet MSL. The eastern portion of the Site consisted of a natural drainage with a base elevation of approximately 136 feet MSL in the northeastern part of the Site and 130 feet MSL in the southeastern part of the Site. In 1967, the drainage was filled to current grades with dried mud excavated from previous sumps and mixed with imported soils. The resulting fill has been described as brown silt with fine-grained sand and some clay.

Soil samples and logs of borings drilled at the Site indicate that the shallow, near-surface soils constitute an upper fine-grained zone (Bellflower aquiclude) consisting mostly of silt and mixtures of clay and fine-grained sand to a depth of approximately 15 feet bgs. An intermediate coarse-grained zone (Exposition aquifer; 15 to 105 feet bgs) consists predominantly of fine- to medium-grained, well-sorted sands with some silt and clay, and interbedded layers and lenses of coarse-grained sand and gravel, with a 15-foot-thick layer of fine- to coarse-grained sands and gravels at the base. A lower fine-grained zone (unnamed aquiclude) consisting of silt and fine-grained sand is found from 105 to 130 feet bgs beneath the western third of the Site. At these depths, sand and gravel (Gage aquifer) are found beneath the eastern two-thirds of the Site as the aquiclude apparently pinches out.

2.2.2 Soil Medium Contaminant Transport

The RI included an evaluation of the potential for future impact to groundwater resulting from the low concentrations of contaminants in shallow soils at the Site. In order to obtain a conservative estimate, the maximum soil concentration for all selected chemicals of concern was evaluated for future impact to groundwater using the VLEACH model, a vadose zone flow and transport model. The mass output of the VLEACH model was input into a groundwater mixing model to estimate the maximum groundwater chemical concentrations (in the uppermost aquifer) that could potentially occur over time as a result of current levels of chemicals in site soils. The evaluation indicated that PCBs and PAHs would not reach groundwater. Maximum soil concentrations of VOCs were predicted to reach groundwater within several years in low part-per-trillion concentrations (see Attachment E of the BHRA, HLA 1995). Such low concentrations are not expected to degrade groundwater. Using average soil concentrations for the Site, the resultant groundwater concentrations would be significantly lower. Therefore, soil contaminants at the Site are not expected to degrade groundwater underlying the Site.

2.3 REMEDIAL ACTION OBJECTIVES

Remedial action objectives have been established for the Site, and represent the specific objectives to be achieved with implementation of the selected remedial alternative. The HSAA incorporates the NCP by reference, including its broad directive to protect public health and the environment and to comply with ARARs. The remedial action objectives have been established in accordance with this framework.

As presented in Section 1.3, all the estimates of potential health risks associated with the current site conditions are within the EPA's acceptable range of risks for potential future on-site workers.

Groundwater beneath the Site is degraded as a result of unrelated off-site activities, and its current use is limited to that of industrial service supply. Reducing the potential migration of PCBs from the shallow soils and maintaining groundwater quality consistent with its designated uses are also reflected in the remedial action objectives established for the Site.

The remedial action objectives formulated for the Site are the following:

- To reduce human health risks;
- To reduce potential migration of PCBs; and
- To maintain groundwater quality consistent with its designated use.

2.3.1 Reduce Human Health Risks

The EPA's "acceptable risk range" as defined by the NCP and other relevant guidance is a cancer risk range of 1 x 10^{-4} to 1 x 10^{-6} and a hazard index less than unity for non-carcinogens. The baseline risk assessment prepared by HLA (HLA, 8-1995) estimated potential cancer risks to range from 9 x 10^{-6} to 4 x 10^{-7} for potential future on-site workers. Approximately 96% of estimated cancer risk is due to the presence of PCBs (RME scenario). The non-cancer hazard indices for all chemicals and for all exposure pathways evaluated were significantly less than unity for potential future on-site workers.

In addition, the potential health impacts associated with exposure to lead through ingestion of contaminated soils were determined to be below the levels of concern established by the DTSC. According to DTSC guidance, a blood lead concentration of 10 micrograms per deciliter of whole blood is acceptable, with an associated point of departure for risk management of 1 (one) percent of exceeding that level. The levels of blood lead concentration estimated for potential future on-site workers were significantly below that acceptable limit.

The significant routes of potential exposure to chemicals of concern for on-site receptors are dermal contact and soil ingestion. Therefore, reducing human health risks to achieve the above mentioned risk levels can be achieved by preventing direct contact with the chemicals of concern in the contaminated soils. Actions, such as restricting site access, paving, or other surface controls and/or the removal of contaminated soil, will mitigate direct contact with chemicals of concern in the contaminated soils and will reduce human health risks to meet the risk-based remedial action objectives.

2.3.2 Reduce Potential Migration of PCBs

Although the results of the site-specific fate and transport assessment indicate that it is highly unlikely that such migration would occur, as discussed in Section 2.1.2 and 2.2.2, one objective for remediation of the contaminated soils will be to reduce the potential for PCB migration from soils to groundwater. This objective can be accomplished by reducing chemical mobility through treatment, minimizing potential for migration through surface controls, or removing contaminated soils from the Site.

2.3.3 Maintain Groundwater Quality Consistent With Its Designated Beneficial Use

Several chlorinated organic compounds and metals have been detected in groundwater beneath the Site at concentrations greater than the California or Federal MCLs. Based on the direction of groundwater flow, it is clear that existing groundwater contamination is the result of off-site activities (HLA, 11-1995). The current designated use for the groundwater beneath the Site is industrial service supply. One objective of the remediation activities to be performed at the Site is to maintain the groundwater quality beneath the Site consistent with its designated beneficial use. This remedial action objective can be accomplished by reducing chemical mobility through treatment, minimizing potential for migration through surface controls, or removing contaminated soils from the Site.

2.4 IDENTIFICATION AND SCREENING OF TECHNOLOGY TYPES AND PROCESS OPTIONS

Remedial technologies and process options meeting the remedial action objectives for the Site soils are indicated in Table 1. Preliminary screening based on technical implementability was completed for each of the process options identified. A subsequent process option evaluation for effectiveness, implementability, and relative cost also was conducted. Remedial technologies and process options not meeting each of the remedial action objectives were eliminated from further consideration in assembling the remedial action alternatives.

2.4.1 Preliminary Screening of Process Options

The preliminary screening indicates that there are a number of technically viable remedial technologies and process options that could be implemented at the Site to meet the remedial action objectives. Several remedial technologies and process options for the various general response action categories have been identified and evaluated. These options include several innovative technologies. The preliminary screening for the Site soils based on technical implementability is presented in Table 2. As indicated in the table, in-situ biological treatment was removed from consideration during the screening because this process cannot be successfully implemented in-situ in fine-grained soils with low permeabilities. The remaining process options were retained for the process option evaluation presented in the next section. For ease of reference, the alternatives developed and evaluated in Section 3.0 have been identified on Table 2.

2.4.2 Evaluation of Process Options

The second tier evaluation consisted of evaluating the effectiveness, implementability, and relative cost for each process option. Effectiveness was evaluated based on the proven reliability of the process option to achieve the remedial action objectives. The implementability evaluation focused on the availability of the technology, ease of permitting, and need for further studies. Qualitative cost comparisons were made among the process options within a single remedial technology category. The process option evaluation for remediation of the Site soils is presented in Table 3. For ease of reference, the alternatives developed and evaluated in Section 3.0 have been identified on Table 3.

The "no further action" response is presented as a baseline case against which other technologies are screened. Institutional controls such as fencing and deed restrictions could be components of a remedial scenario as these measures prevent the potential for direct contact with Site soils.

The potential containment options considered were clay/soil caps and pavement caps. The most desirable capping option is a pavement cover because it is a low permeability layer that retards infiltration, provides adequate drainage control to divert surface water flow, allows future development of the area, and is a low cost option.

Chemical fixation, solvent extraction, and soil washing were retained as potential in-situ chemical treatment options.

In-situ biodegradation was eliminated because it is not effective in fine-grained soils and because of the uncertainty regarding its success treating PCBs.

In-situ vitrification was retained as a potential in-situ thermal treatment option. Infrared desorption was eliminated because there are no state permitted units currently available.

Incineration and landfilling were retained as off-site management options. Off-site chemical fixation was not further considered because it would be considerably more expensive than on-site chemical fixation/solidification as a result of transportation costs.

An additional option that was considered and retained is a combination of on-site surface controls with partial removal and off-site disposition of shallow soils from hot spots.

3.0 DEVELOPMENT AND SCREENING OF ALTERNATIVES

Remedial action alternatives were formulated based on the screening and evaluation of remedial technologies and process options presented in Section 2.4. The criteria for development of alternatives are discussed in Section 3.1. The evaluation of alternatives based on effectiveness, implementability, and cost is presented in Section 3.2.

3.1 DEVELOPMENT OF ALTERNATIVES

Remedial technologies and process options identified in the initial screening that appeared most promising to achieve the remedial action objectives were selected for evaluation as remediation alternatives.

The alternatives selected for evaluation are the following:

- Alternative 1: No further action;
- Alternative 2: Surface controls;
- Alternative 3: Chemical fixation;
- Alternative 4: Solvent extraction;
- Alternative 5: Soil washing;
- Alternative 6: In situ vitrification;
- Alternative 7: Incineration;
- Alternative 8: Off-site disposal; and
- Alternative 9: Partial excavation with off-site disposition and on-site surface controls.

3.2 DETAILED DESCRIPTION OF ALTERNATIVES

3.2.1 Alternative 1 - No Further Action

In this alternative, no action is taken to contain or treat the Site soils beyond the remedial actions that have already been performed at the Site, as described in Section 1.1.4. Direct contact with Site soils will be prevented because access to the Site is currently controlled by a fence.

3.2.2 Alternative 2 - Surface Controls

Surface controls are designed to minimize surface water infiltration through the installation of a cap. Grading of the ground surface or sloping of the engineered cap also help to minimize infiltration by maximizing the amount of water which will run off without causing significant erosion. This alternative consists of the installation of a pavement cap over the area where soils with low concentrations of contaminants are located.

The soils over which the pavement cap would be placed are located in the bermed area around the former AGSTs in the Lakewood Section. This area lies in a depression surrounded by a two- to three-foot high earthen berm. As part of the implementation of surface controls, the berm would be graded using heavy equipment to fill the depression. Care must be taken to minimize any disturbance to the impacted soils during the grading process. Three layers form the capping system: a buffer layer of soil; a base layer on top of the buffer layer; and a pavement layer. The buffer layer of soil may be borrowed from another area of the Site, if available, or may be imported from an off-site source. This buffer layer will be compacted over the impacted soils and will have a minimum thickness of six inches. The base layer may be a crushed concrete base or a rock base, with a minimum thickness of ten inches, and is compacted over the buffer layer. A layer of asphalt pavement, with a minimum thickness of two inches, is placed over the base layer. The finished surface is sloped similar to a typical parking lot, thus providing adequate run off and accommodating future Site improvements.

3.2.3 Alternative 3 - Chemical Fixation

The purpose of Chemical Fixation and Solidification (CFS) systems is to preclude soils from leaching hazardous contaminants. CFS systems not only solidify the waste by chemical means but also insolubilize, immobilize, encapsulate, destroy, sorb, or otherwise interact with selected waste components. Chemical fixation has been used successfully to treat PCB-containing soil in California. However, potential interference may occur if hydrocarbons are present in the soils to be treated; the process is best suited for the treatment of inorganic contaminants, particularly metals.

Typically, the waste to be treated is conveyed by pump, mechanical conveyor, or other means into a surge tank or feed hopper, which in turn feeds the waste into a mixer where it is blended with CFS reagents. Depending on the process used, one or more dry and/or liquid components may be added to the waste in the mixer. The mixing process normally takes from 1 to 15 minutes, depending on the mechanical system used, the size of the batch, the type of waste, and the amounts and types of reagents being used. After mixing is complete, the waste, still in liquid or semisolid form (in many cases), is removed from the mixer and moved by pump or conveyer to an area where it can solidify and develop its final physical and chemical properties. Once this process is complete, the treated material will be tested for leachability.

With certain notable exceptions, all presently used commercial CFS processes are quite simple and utilize standard mechanical equipment in their operation. Treated soils that fail leaching tests due to elevated levels of PCBs will require off-site disposal at a hazardous waste landfill. Consequently, a combination of chemical fixation with off-site disposal will be necessary. Soils that are more resistant to potential leaching of hazardous chemicals, as determined by standard leachability tests, can be placed in the excavation in such a way so as to optimize compaction. Envirotech and Silicate Technology Group are potential vendors for this technology.

3.2.4 Alternative 4 - Solvent Extraction

Terra-Kleen operates a mobile soil restoration unit that removes contaminants from excavated soil and sediment using nontoxic solvents. Debris up to 3 feet in diameter can be processed.

Within the unit, the soil is continuously washed with solvents, using a proprietary process. The contaminants dissolve in the solution and are removed from the soil. The contaminated solvents are reclaimed in a closed-loop circuit, eliminating the need for large volumes of solvent. The clean washed soil is removed to a closed-loop dryer system where any excess solvent is removed from the soil. When the soil exits the system, it is clean and dry. The collected contaminant from the solvent washing is concentrated 1,000 to 10,000 times, reducing the volume and disposal cost. The contaminant is periodically pumped from the system into labeled 55-gallon drums for conventional off-site disposal. Treated soil may be reused on site.

The Terra-Kleen unit was the first solvent extraction system to be successfully used for the full-scale remediation of a Superfund site contaminated with PCBs. The system requires performance of a treatability study to gauge its potential effectiveness. The system may be unsuccessful processing fine-grained soils.

3.2.5 Alternative 5 - Soil Washing

Soil washing is a mechanical separation process that removes contaminants from a large portion of the influent soil. The cleaned soil exits the system and is backfilled on-site. Extracted contaminants are concentrated in a remaining, smaller portion of the soil in the treatment unit. The smaller amount of contaminated soil is disposed of at an appropriately permitted landfill. The soil washing process may be used to treat soils contaminated primarily with organics, and can also be used to remove heavy metals, radionuclides, and combinations of contaminants, if the conditions are adequate. The effectiveness of the soil washing process is primarily dependent on soil type. Fine or clay soil is difficult to treat whereas gravels are easier to treat.

The process has three basic steps: initially the contaminated soils are screened and coarse materials are washed; subsequently, the remaining solids are broken up and thoroughly washed; and finally, the material undergoes a high-intensity leaching step and contaminated fine-grained material is separated from the clean soil.

Mobile soil washing units are available from a variety of vendors. Bergmann USA maintains a soil washing unit that processes a continuous feed of soil at 15 tons per hour. The process would render between 60% and 75% of the input soil suitable for reuse. Approximately 21,000 gallons of waste process liquid would also be generated.

3.2.6 Alternative 6 - In-Situ Vitrification

In-situ vitrification (ISV) involves the melting of contaminated solids using electric current for purposes of destroying/removing hazardous organics and immobilizing/removing hazardous inorganic contaminants by converting the contaminated soil into a glass and microcrystalline residual product. Organics are destroyed by pyrolysis (i.e., thermal decomposition); inorganics are immobilized by chemical incorporation in the melt and resulting residual product. ISV may be applied to contaminated solid media such as soil, sediment, tailings, and sludge. The material may be treated in-situ or at a staged location.

ISV typically uses four electrodes in a square array for treating individual melts (batches) of up to 1,000 tons. The typical soil melt temperature is 1,600 to 2,000°C. Large-scale processing rates are 4 to 6 tons per hour; the process operates 24 hours per day. An off-gas collection hood is employed over the treatment zone to collect gases/vapors emitted from the treated material and to direct the gases/vapors to a treatment system involving quenching, scrubbing, mist elimination, heating, filtering, and activated carbon adsorption unit processes. The process equipment is mounted on three over-the-road trailers and may be quickly mobilized to a site. The process can be powered by existing electrical service lines or by a diesel generator. Typical applications require 800 to 1,000 kilowatts per ton for treatment. The residual ISV product offers 20- to 45-percent volume reduction and excellent structural, weathering, and biotoxicity properties. Geosafe Inc. is a potential vendor for soil vitrification.

3.2.7 Alternative 7 - Incineration

Incineration is an effective process for destruction of PCBs. No incineration units have been permitted for destruction of PCBs in California, and thus such units are not considered further. Waste soil could be shipped to an out-of-state treatment facility if incineration is the selected remedial method.

3.2.8 Alternative 8 - Off-site Disposal

Soil with elevated concentrations of PCBs can be excavated and disposed of at an appropriate Class I hazardous waste landfill. Off-site disposal involves transporting PCB-containing soil to an appropriate landfill facility by a licensed hazardous waste transporter. The hazardous soil must be manifested, and the landfill facility will require the soil to be tested prior to disposal in cells reserved for hazardous wastes. Soils with elevated concentrations of lead will require chemical fixation at the landfill. Licensed Class I landfills for PCB-containing soil disposal are operated by US Ecology at Beatty, Nevada, and by ChemWaste Management at Kettleman Hills, California. Nonhazardous soil can be segregated from the hazardous soil and disposed of at a local nonhazardous landfill facility.

3.2.9 Alternative 9 - Partial Excavation and off-site Disposition with on-site Surface Controls

This alternative constitutes a combination of Alternatives 2, Surface Controls, and Alternative 8, Off-site Disposal. Excavation of hot spots to remove PCB-contaminated soils will be followed by backfilling and grading, and finally by the installation of a pavement cap identical to that described under Alternative 2.

3.3 SCREENING OF ALTERNATIVES

Consistent with the NCP requirements for conducting feasibility studies, Alternatives 1 through 9 were screened against the criteria of effectiveness, implementability, and order-of-magnitude cost. Through the screening presented below, Alternatives 2, 3, and 9 are judged to have the greatest potential to achieve the remedial action objectives. Thus, these alternatives are advanced for detailed evaluation, as described in Section 4.0. The screening of Alternatives 1 through 9 is presented in Table 4.

For the purposes of preliminary order-of-magnitude cost comparisons, it was assumed that the volume of soils requiring remediation at the Site corresponds to the hot spots that exhibit PCB concentrations above 50 ppm, which are located on the northern portion of the Lakewood Section (see Figure 3; between 0 and 5 feet bgs, in the area near borings 1(B), TW-4B, and 7B, and near the underground storage tank excavation, and between 0 and 15 feet bgs, in the area near boring TW-1). The estimated volume of soils in the affected areas is approximately 900 cubic yards. A contingency cost has been added to the total estimated cost for each alternative. A 50-percent contingency was added to the estimated costs for chemical fixation to account for the potential need for off-site disposal because of uncertainties regarding the result of treatability studies (and possible need for petroleum hydrocarbon pretreatment). A 25-percent contingency was added to all other estimated costs to cover uncertainties relating to remediation of subsurface soils. The estimated cost to remediate the Site will be further evaluated as part of the Remedial Action Plan.

Based on the evaluation criteria, Alternative 1 and Alternatives 4 through 8 are eliminated from further consideration. Two of these alternatives (Alternatives 4 and 5) are inadequate as a result of the site conditions, particularly the presence of fine-grained soils. Alternative 6 was eliminated because the resulting treated material would potentially hinder future uses of the Site and because of the uncertainty regarding the effectiveness of the process in fine-grained soils. Alternative 7 was eliminated because its cost is one order of magnitude greater than that for the other alternatives. Alternative 8 was eliminated because Alternative 9, which is very similar, additionally provides for on-site surface controls.

4.0 DETAILED EVALUATION OF ALTERNATIVES

According to the NCP, a detailed analysis is required after the screening analysis is completed for those alternatives that present a viable approach to remediation. This assessment consists of an evaluation of the individual alternatives against the NCP evaluation criteria and a comparative analysis that focuses upon the relative performance of each alternative against those criteria (40 CFR 300.430(e)(9)). Of the nine criteria specified in the NCP, the first seven are used for these evaluations. These criteria are: (1) overall protection of human health and the environment; (2) compliance with ARARs; (3) long-term effectiveness and permanence; (4) reduction of toxicity, mobility, or volume through treatment; (5) short term effectiveness; (6) implementability; and (7) cost. The eighth NCP criterion, state acceptance, will be fulfilled when the DTSC approves the FS and the RAP for the Site. The final NCP criterion, community acceptance, is not evaluated until after public comment on the FS report and the RAP. The costs discussed in this FS do not include permitting. Permitting costs will become known once the final remedial design is approved by the Agency.

4.1 INDIVIDUAL EVALUATION

Of all the alternatives evaluated in the previous section, only Alternatives 2, 3, and 9 are retained for further evaluation.

4.1.1 Alternative 2 - Surface Controls

Overall Protection of Human Health and the Environment. Containment through surface controls, specifically through the placement of a pavement cover, will reduce potential direct exposure to soil contaminants, as well as potential exposure to dust that may carry those contaminants. By placing a pavement cover, surface water infiltration will be reduced, thereby reducing mobility and mitigating potential downward migration of contaminants. In the case of PCBs, modeling has established that even in the absence of the cap, PCBs will not reach groundwater.

Compliance with ARARs. Surface controls can be implemented in compliance with the state and federal ARARs, as described in the Appendix. Remediation will be completed in compliance with TSCA, RCRA, and HWCL to the extent that PCB-waste and/or hazardous waste may be managed during remediation.

ARARs from state and federal water and air quality programs will also govern Site remediation activities. Air emission permits may be required by the SCAQMD for grading activities, while stormwater discharge permits for construction activities may be required by the RWQCB. A worker health and safety program will be developed and implemented to comply with applicable federal and state occupational safety and health regulations.

Long-Term Effectiveness and Permanence. Surface controls will provide long-term isolation of the contaminated soils, thus reducing the potential for long-term risks arising from direct contact with chemicals of concern in the soils. The long-term effectiveness is expected to be high, based on the specifications established for the layers that form the pavement cap. This alternative, like any other alternative that may ultimately be implemented, will be accompanied by institutional controls, such as fencing (which already exists at the Site) and deed restrictions, that will prevent inappropriate future development and/or use of the affected areas of the Site.

Reduction of Toxicity, Mobility, or Volume through Treatment. Surface controls will directly affect the mobility of the contaminants present in the soil, reducing the potential for downward migration by minimizing infiltration of surface water. However, the alternative does not involve treatment of the contaminated soils.

Short Term Effectiveness. As described in the BHRA and summarized in Section 1.3 of this FS, the short-term risks to nearby receptors associated with the contaminants present at the Site are within the ranges considered acceptable by the EPA. Any potential risks associated with the actual implementation of this alternative will be mitigated through compliance with the conditions and requirements established in the permits to be obtained from the SCAQMD and the RWQCB.

Implementability. This alternative is both technically and administratively feasible, and can be completed within a relatively short time and with minimal disruption of Site soils. All necessary measures will be taken in order to comply with the conditions of the local permits and of the permits to be obtained from the SCAQMD and the RWQCB.

Cost. This alternative has the lowest cost of all the alternatives evaluated. The estimated cost for this alternative is \$60,000 - \$80,000, which is significantly lower than the cost for Alternatives 3 and 9. The cost was based on an estimated area to be paved that approximately corresponds to the bermed area surrounding the former AGSTs.

4.1.2 Alternative 3 - Chemical Fixation

Overall Protection of Human Health and the Environment. Chemical fixation will reduce potential direct exposure by fixing the contaminants in a matrix. The mobility of contaminants in soils will be significantly reduced by minimizing the potential for leaching of metals and potentially reducing for organic constituents (to be determined through a treatability study).

Compliance with ARARs. Chemical fixation can be implemented in compliance with the state and federal ARARs, as described in the Appendix. In the event that treated material must be disposed of off-site, the process will be completed in compliance with TSCA, RCRA, and HWCL to the extent that PCB-waste and/or hazardous waste may be produced and managed during remediation.

ARARs from state and federal water and air quality programs will also govern Site remediation activities. Air emission permits will be required by the SCAQMD for excavation activities, while stormwater discharge permits for construction activities will be required by the RWQCB. A worker health and safety program will be developed and implemented to comply with applicable federal and state occupational safety and health regulations.

Long-Term Effectiveness and Permanence. Chemical fixation will provide long-term control of the contaminated soils by fixing them permanently in a solid matrix, thus reducing the potential for long-term risks arising from direct contact with chemicals of concern in the soils. The long-term effectiveness is expected to be high, based on the stability of the treated soil matrix. As indicated above, this alternative, like any other alternative that may ultimately be implemented, will be accompanied by institutional controls, such as fencing (which already exists at the Site) and deed restrictions, that will prevent inappropriate future development and/or use of the affected areas of the Site.

Reduction of Toxicity, Mobility, or Volume through Treatment. The primary impact of chemical fixation is a reduction in the mobility of the contaminants by binding them in a solid matrix. Consequently, some corresponding reduction in toxicity of the soils, as measured by standard leaching tests, particularly for metals, also is expected. Chemical fixation of the contaminated soils will not reduce the volume or mass of contaminants, except in the event that the material is removed and ultimately disposed of off-site.

Short Term Effectiveness. As described in the BHRA and summarized in Section 1.3 of this FS, the short-term risks to nearby receptors associated with the contaminants present at the Site are within the ranges considered acceptable by the EPA. Any potential risks associated with the actual implementation of this alternative will be mitigated through compliance with the conditions and requirements established in the permits to be obtained from the SCAQMD and the RWQCB.

Implementability. Chemical fixation has been used to treat soils containing PCBs. However, a treatability study is required, because of potential interferences associated with petroleum hydrocarbons. Pretreatment for elevated petroleum hydrocarbons may be necessary, depending on the outcome of the treatability study. In some cases, after treatment has been completed and satisfactory remediation has been demonstrated, it may be possible to obtain an authorization of the regulatory agency to use the treated material as backfill at the Site, thus eliminating the need and associated cost to transport and dispose of that material at an off-site facility.

Cost. The estimated cost for implementation of this alternative is approximately $160,000 - $180,000. However, there is significant uncertainty associated with that estimate, because of the potential need for pretreatment of the contaminated soils. Additional costs may arise associated with gaining approval to use the treated material as backfill, if that option is technically feasible (i.e., after demonstration that the treated material is non-hazardous and inert).

4.1.3 Alternative 9 - Partial Excavation with Off-site Disposition and On-site Surface Controls

Overall Protection of Human Health and the Environment. Removal of the PCB-contaminated soils from hot spots at the Site and their ultimate disposition off-site, at a properly permitted facility, followed by the implementation of surface controls, specifically through the placement of a pavement cap, will protect human health and the environment. The material removed from the affected areas will be managed and disposed of in accordance with applicable laws. The placement of the surface controls at the Site will reduce potential direct exposure to soil contaminants, as well as potential exposure to dust that may carry those contaminants. By placing a cap, surface water infiltration will be reduced, thereby reducing mobility and mitigating potential downward migration of contaminants. In the case of PCBs, modeling has established that even in the absence of the cap, PCBs will not reach groundwater. Under this alternative any such potential is reduced even further by removing the soils with the most significant PCB concentrations.

Compliance with ARARs. Similarly to Alternatives 2 and 3, partial excavation with off-site disposition and on-site surface controls can be implemented in compliance with the state and federal ARARs, as described in the Appendix. Any PCB-waste and/or hazardous waste produced and managed during remediation, and particularly any such materials to be disposed of off-site, will be handled in compliance with the Toxic Substances Control Act (TSCA), the Resource Conservation and Recovery Act (RCRA), and the California Hazardous Waste Control Law (HWCL).

ARARs from state and federal water and air quality programs will also govern Site remediation activities. Air emission permits will be required by the SCAQMD for excavation activities, while stormwater discharge permits for construction activities will be required by the RWQCB. Local permits will also be required. A worker health and safety program will be developed and implemented to comply with applicable federal and state occupational safety and health regulations.

Long-Term Effectiveness and Permanence. Similarly to Alternative 2, Alternative 9 will provide long-term isolation of the contaminated soils, thus reducing the potential for long-term risks arising from direct contact with chemicals of concern in the soils. The soils in the hot spots will be removed permanently from the Site and disposed of off-site in a properly permitted facility, while soils with low levels of contaminants that remain at the Site will be isolated by the pavement cap to be placed over the area of interest. The long-term effectiveness is expected to be high, based on the specifications established for the layers that form the pavement cap. This alternative, like any other alternative that may ultimately be implemented, will be accompanied by institutional controls, such as fencing (which already exists at the Site) and deed restrictions, that will prevent inappropriate future development and/or use of the Site.

Reduction of Toxicity, Mobility, or Volume through Treatment. The removal of the PCB-contaminated soils from hot spots for off-site disposition and their replacement with clean fill constitutes a significant reduction in both the volume and the toxicity of the materials at the Site. The implementation of surface controls as part of this alternative will directly affect the mobility of the contaminants present in the soil, reducing the potential for downward migration by minimizing infiltration of surface water. However, this alternative does not necessarily involve treatment of the contaminated soils. Soils may require stabilization prior to their placement in a landfill, thus reducing the overall mobility and to some extent the toxicity of the contaminated soils.

Short Term Effectiveness. As described in the BHRA and summarized in Section 1.3 of this FS, the short-term risks to nearby receptors associated with the contaminants present at the Site are within the ranges considered acceptable by the EPA. Any potential risks associated with the actual implementation of this alternative will be mitigated through compliance with the conditions and requirements established in the permits to be obtained from the SCAQMD and the RWQCB.

Implementability. This alternative is both technically and administratively feasible. Off-site disposal at a properly permitted landfill is a proven, effective remedial action. Construction activities associated with the excavation of hot spots, backfilling with clean soil, and subsequent placement of the pavement cap will be carefully supervised to comply with the requirements for air and water quality protection established in the permits to be obtained from the SCAQMD and the RWQCB.

Cost. The estimated cost for this alternative ranges between $520,000 to $650,000, depending on the need for pretreatment prior to land disposal at a properly permitted facility. This cost includes the cost for construction of the pavement cap, with the same specifications used under Alternative 2. The cost was based on an estimated area to be paved that approximately corresponds to the bermed area surrounding the former AGSTs.

4.2 COMPARATIVE EVALUATION

In this section, the relative performance of each alternative against the NCP criteria is evaluated so that the advantages and disadvantages of the alternatives can be weighed. In this process, the first two NCP evaluation criteria, overall protection of human health and the environment and compliance with ARARs, serve as "threshold" determinations that must be satisfied before an alternative is selected as the proposed remedy. The next five NCP criteria serve as the balancing criteria. A comparison of the relative advantages and disadvantages of the alternatives as qualified by the balancing criteria allows selection of the remedial alternative that best meets the remedial action objectives.

4.2.1 Overall Protection of Human Health and the Environment

The three alternatives evaluated appear to be adequately protective of human health and the environment, both in the short-term and in the long-term. Taking into consideration that, as indicated in the BHRA and summarized in Section 1.3 of this FS, the health risks associated with the contamination currently present at the Site are within the acceptable risk ranges as established by the EPA, for both carcinogenic and non-carcinogenic contaminants, the implementation of any of the three alternatives being evaluated will result in a further reduction of the risk, through reduction of mobility, toxicity and/or volume. Alternatives 2 and 9 clearly reduce the potential for direct exposure to contaminants and to dust containing the contaminants. The three alternatives reduce the potential migration downward of contaminants present in the shallow soils. Alternative 3 may be particularly effective in reducing mobility, but there is uncertainty regarding potential interferences in the fixation process caused by petroleum hydrocarbons. Alternative 9, and potentially Alternative 3 also (if treated soils cannot be used as backfill) will result in a reduction in the mass of contaminants at the Site, by removing a portion of the contaminated soils for off-site disposition.

In summary, Alternative 9 may be more protective than the other two alternatives; there is some level of uncertainty regarding the effectiveness of Alternative 3 due to the potential for interferences; Alternative 2 is adequately protective.

4.2.2 Compliance with ARARs

All three alternatives can be implemented in compliance with ARARs. For all alternatives, it is assumed that local permits as well as permits associated with construction activities under air and water quality programs will be required. Under Alternatives 3 and 9, transportation and off-site disposal of contaminated materials will be conducted in accordance with applicable regulations. Only properly permitted transporters and off-site treatment and disposal facilities will be used as part of the implementation of these alternatives. Alternative 2 is the least complicated alternative with respect to the applicable regulatory requirements, as no material will be excavated and transported off-site for disposal and that no treatment process will be operated on-site as part of its implementation.

4.2.3 Long-Term Effectiveness and Permanence

As discussed in Section 4.1, the three alternatives appear to be adequate in terms of their long-term effectiveness and permanence. However, the effectiveness of Alternative 3 must be verified through a treatability study because potential interferences exist associated with the presence of petroleum hydrocarbons in the contaminated soils. Alternatives 2 and 9 are both adequate and comparable in their long-term effectiveness and permanence.

4.2.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Alternatives 2 and 9 will result in a decrease in mobility by reducing the infiltration of surface water through the contaminated shallow soils. However, Alternative 2 does not involve treatment. Alternative 9 may require stabilization of the excavated material prior to its final off-site disposal in a properly permitted facility; that stabilization would result in a reduction in mobility, and to some extent a reduction in toxicity, of the contaminated soils removed from the Site. This alternative may require a treatability study. Alternative 3, subject to verification through a treatability study, would directly affect the mobility, and to some extent the toxicity, of contaminants present in the soils at the Site. As indicated above, the process prevents leaching by binding the contaminants in a solid matrix.

4.2.5 Short Term Effectiveness

The three alternatives evaluated are similarly effective in the short term. However, Alternative 2 will have a greater effectiveness, because its implementation does not involve excavation of the contaminated soils and the associated potential for worker exposure.

4.2.6 Implementability

Alternative 2 is the most readily implementable of the three alternatives evaluated, followed by Alternative 9. Alternative 3 requires the performance of a treatability study to verify its effectiveness and may require an extended negotiation in the event that treated soils were to be used as backfill at the Site. Alternatives 3 and 9 are likely to have more complicated requirements and permit conditions established by the SCAQMD and the RWQCB due to the fact that they involve excavation of the contaminated soils.

4.2.7 Cost

The cost for Alternative 2 is approximately one order of magnitude lower than the cost for the other two alternatives. The uncertainties associated with the feasibility of using treated soil as backfill under Alternative 3 may increase its cost to a level comparable to that of Alternative 9.

5.0 ALTERNATIVE SELECTION AND IMPLEMENTATION

The remedial alternatives included in this FS were developed, screened and evaluated in accordance with the NCP and guidelines developed pursuant to the NCP (EPA, 1988). **Alternative 2, the Surface Controls Alternative**, is the most suitable alternative based upon the seven applicable NCP criteria. This alternative satisfies the NCP threshold criteria (overall protection of human health and the environment, and compliance with ARARs) and provides the best combination of the balancing criteria (long-term effectiveness and permanence; reduction of toxicity, mobility, and/or volume; short-term effectiveness; implementability; and cost). The other two NCP criteria, agency acceptance and community acceptance will be addressed following DTSC review and public comment, respectively.

Figures 4 and 5 describe the proposed remedial alternative. Figure 4 shows a plan view of proposed area for implementation of surface controls, which primarily corresponds to the bermed area surrounding the former AGSTs. Figure 5 presents an idealized cross section of conceptual design for the pavement cap to be implemented under Alternative 2.

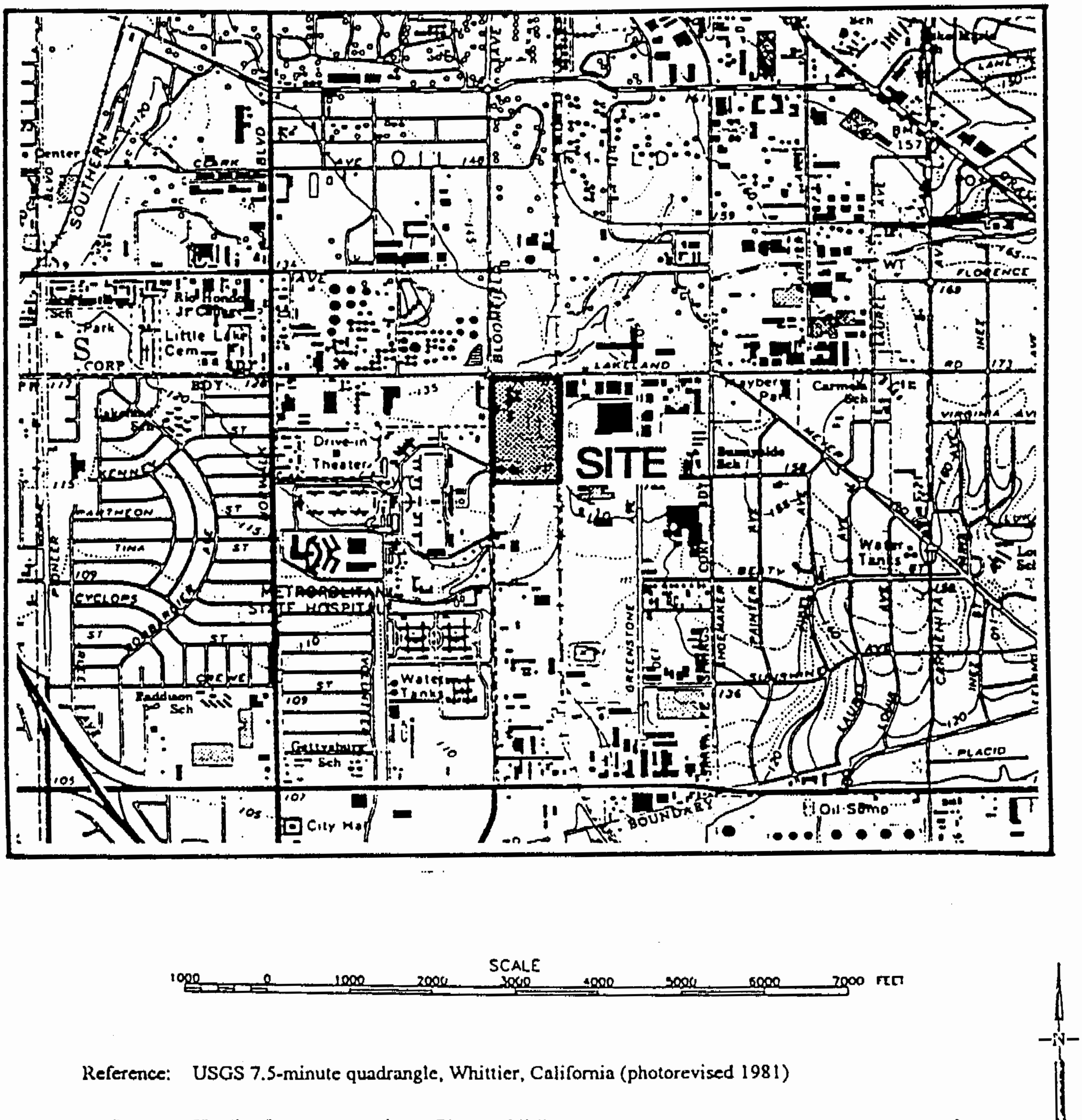
The preliminary selection of the Surface Controls Alternative as the preferred remedy for the Site will be confirmed in the proposed remedial action plan to be prepared following approval of this feasibility study by the DTSC. The alternative selected for implementation in the remedial action plan must meet the statutory requirements identified in the HSAA (H&S Code Sections 25301 et seci.), specifically Sections 25350 and 25356.1. Section 25350 requires that remedial action plans under the HSAA be developed consistent with the priorities, guidelines, criteria, and regulations contained in the NCP. Section 25356.1 identifies additional criteria which must be fulfilled in order for a selected alternative to be acceptable as a RAP. The proposed RAP will include the detailed evaluation of the selected alternative relative to the applicable criteria.

6.0 REFERENCES

EPA, 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA.* OSWER Directive 9355.3-01, October 1988.

Harding Lawson Associates (HLA), 1995. *Remedial Investigation (Volumes I - III). Baseline Health Risk Assessment (Volume IV). Walker Property Site. Santa Fe Springs, California.* August 25, 1995.

FIGURES



Reference: USGS 7.5-minute quadrangle, Whittier, California (photorevised 1981)

Source: Harding Lawson Associates (Plate 1, 8/94)

ENVIRONMENTAL STRATEGIES CORPORATION

ESC

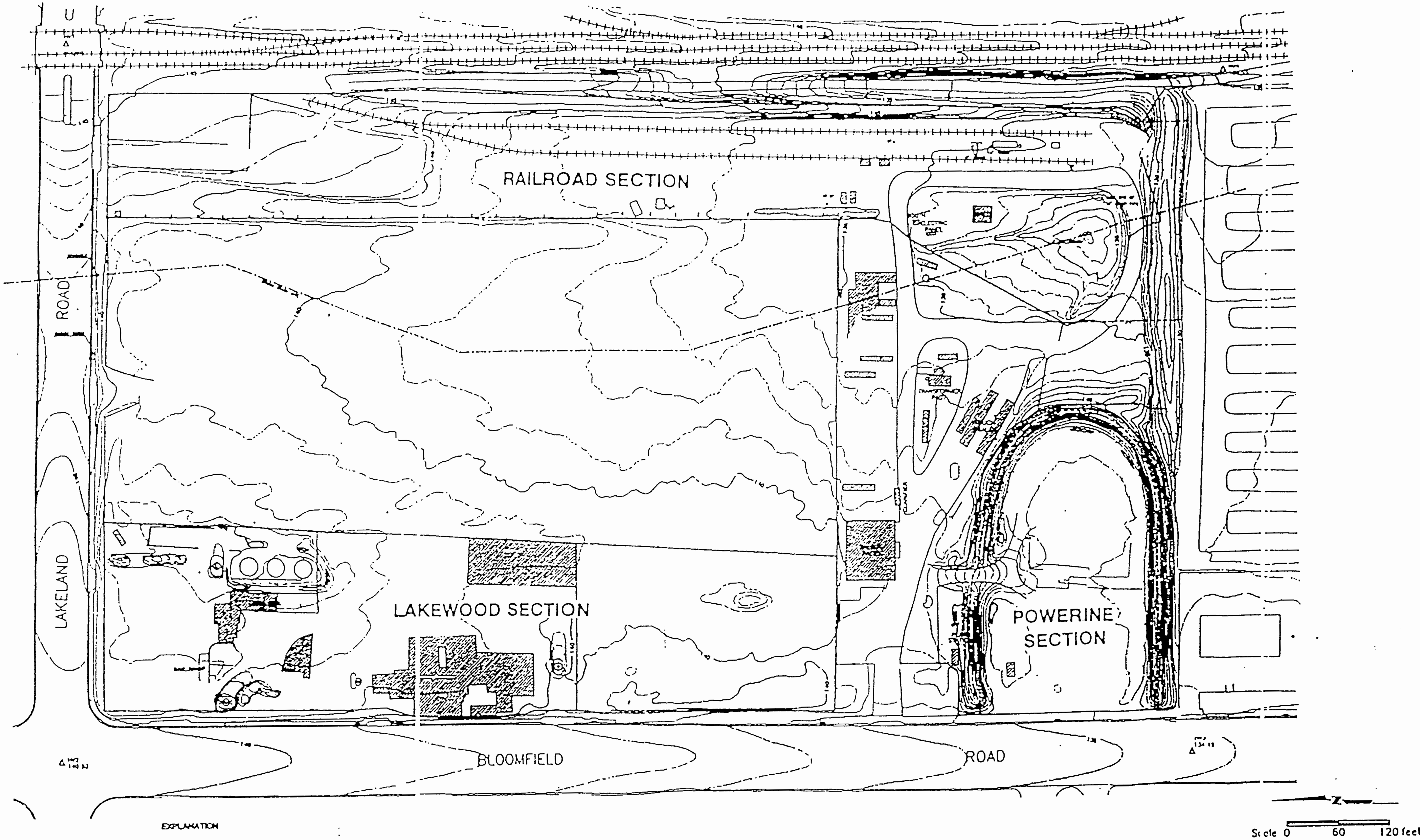
FIGURE 1

VICINITY MAP

Walker Property Site

Santa Fe Springs, California

APRIL 1996



EXPLANATION

- LOCATION OF FORMER UNDERGROUND STORAGE TANK
- LAKEWOOD OIL SERVICE
- MOHAWK SALES, INC.
- NORWALK DISPOSAL
- CONCRETE PAD

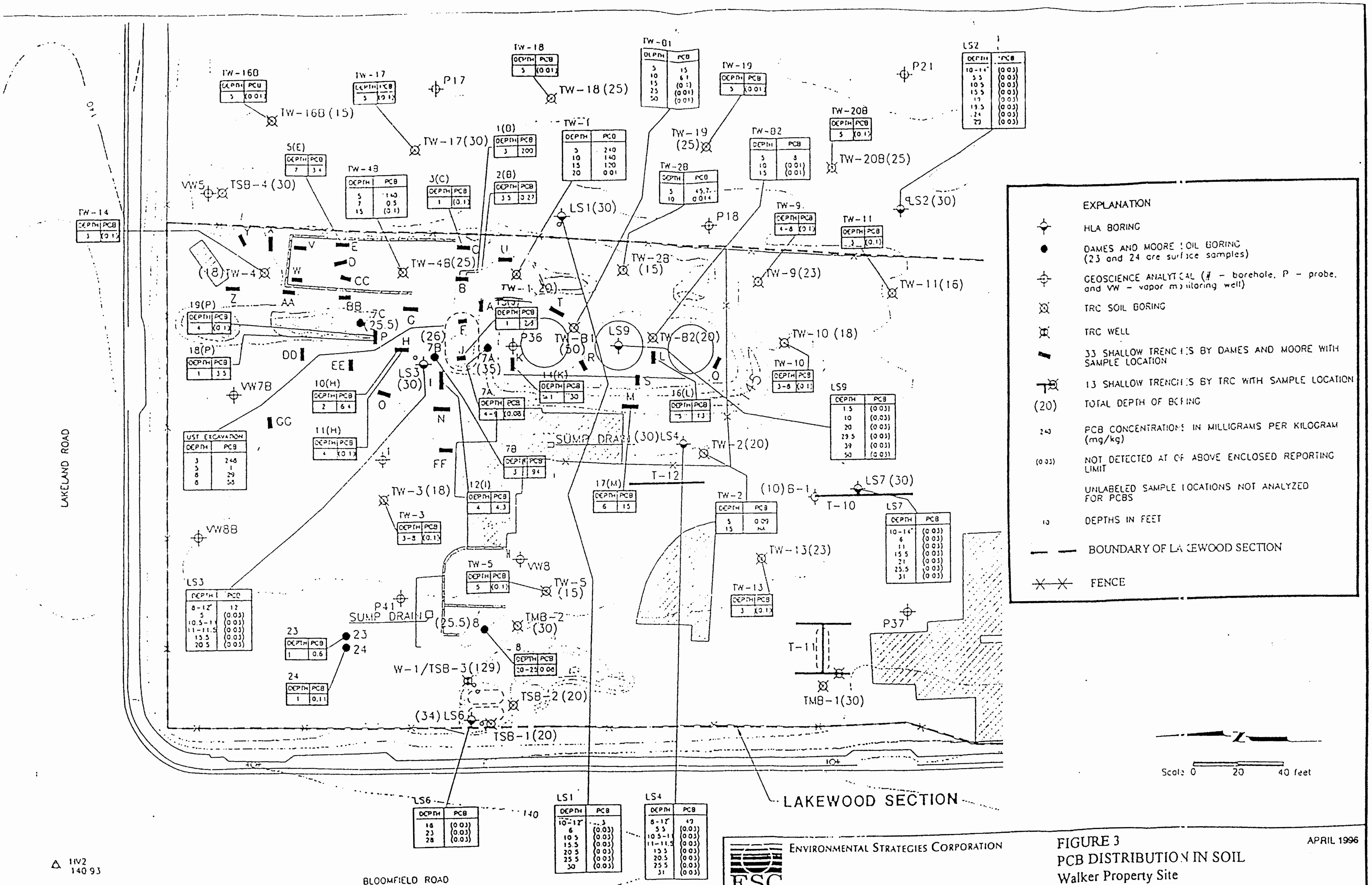
Note:
LOCATIONS OF PREVIOUS TENANTS ARE APPROXIMATE. LEASEHOLD BOUNDARIES UNKNOWN.

SOURCE: Harding Lawson Associates (Plate 2, 9/94)

ESC ENVIRONMENTAL STRATEGIES CORPORATION

FIGURE 2
SITE PLAN
Walker Property Site
Sante Fe Springs, California

APRIL 1996



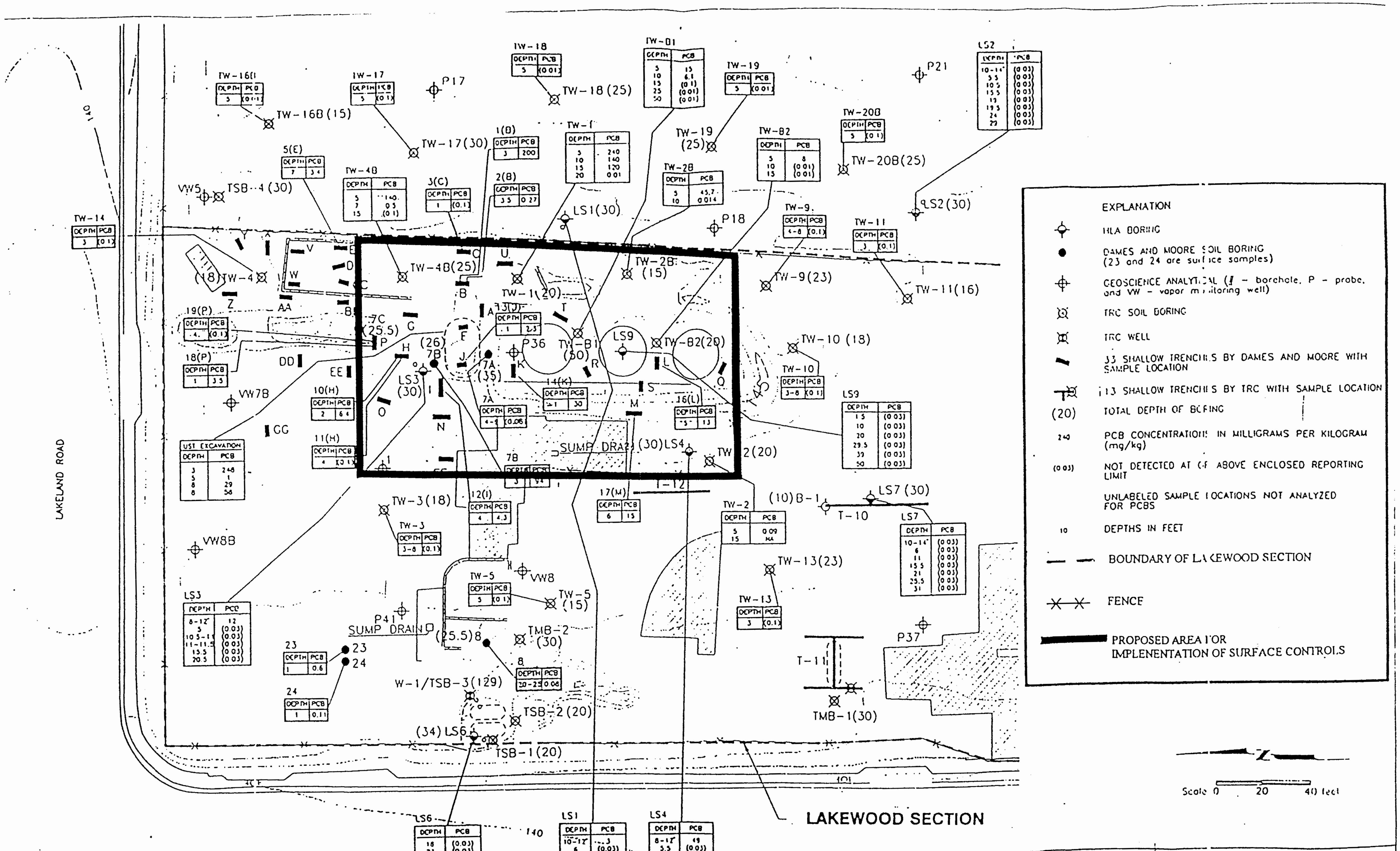
ENVIRONMENTAL STRATEGIES CORPORATION

ESC

FIGURE 3
PCB DISTRIBUTION IN SOIL
Walker Property Site
Santa Fe Springs, California

APRIL 1996

SOURCE: Harding Lawson Associates (Plates 13c, 8/94)

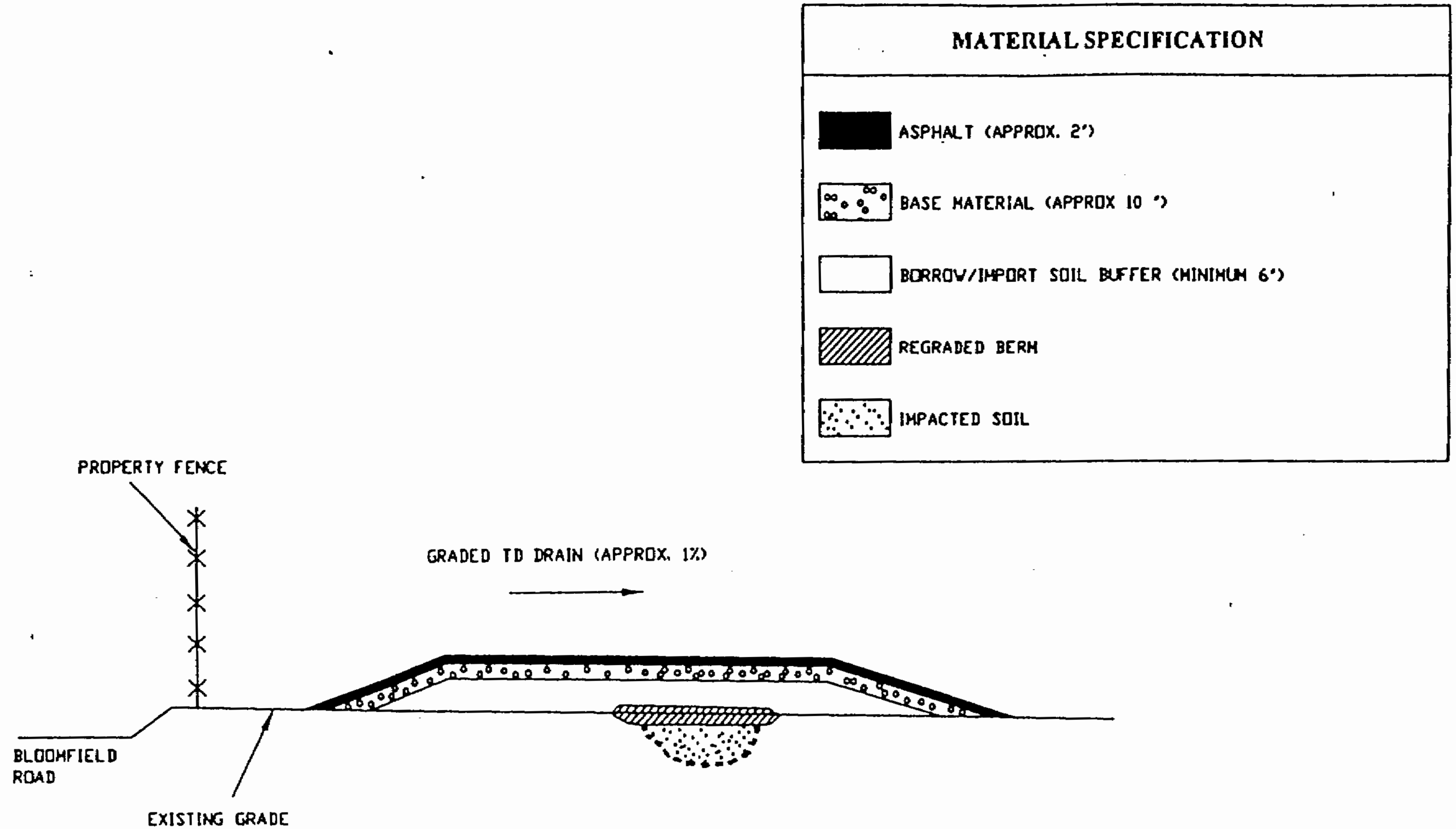


SOURCE: Harding Lawson Associates (Plates 13c, 8/94)

ENVIRONMENTAL STRATEGIES CORPORATION

FIGURE 4
PROPOSED AREA FOR IMPLEMENTATION OF SURFACE CONTROLS (ALTERNATIVE 2)
Walker Property Site
Santa Fe Springs, California

APRIL 1996



NOT TO SCALE

ENVIRONMENTAL STRATEGIES CORPORATION

ESC

FIGURE 5
IDEALIZED CROSS SECTION OF CONCEPTUAL DESIGN FOR SURFACE CONTROL (ALTERNATIVE 2)
Walker Property Site
Santa Fe Springs, California

APRIL 1996

TABLES

TABLE 1
SUMMARY OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS FOR SOIL REMEDIATION

Remedial Action Objective	General Response Actions	Remedial Technologies	Process Options
Reduce human health risk by diminishing potential exposure to contaminants of concem at the Site	No further action:	No further action:	
	No further action	None	Not applicable
	Institutional controls:	Institutional controls:	
	Access restrictions	Fencing	Fencing
Reduce potential migration of PCBs off-site or into groundwater	Containment actions:	Containment Technologies:	
	Surface controls	Surface controls	Clay/soil, pavement with surface water controls, geomembrane, multi-layer system
	Treatment actions:	Treatment technologies:	
Maintain groundwater quality consistent with its designated use	In-situ treatment	Chemical treatment	Fixation/solidification
	On-site treatment		On-site solvent extraction
			On-site soil washing
		Biological treatment	In-situ bioremediation
		Thermal treatment	In-situ vitrification, on-site infrared desorption
	Removal - treatment - disposal actions:	Removal - treatment-disposal technologies:	
	Removal - off-site treatment	Off-site thermal treatment	Off-site incineration
	Removal - off-site treatment - disposal	Off-site chemical treatment	Off-site fixation/solidification
	Removal - disposal	Off-site disposal	Off-site landfill
	Focused removal/disposition + containment actions:	Focused removal/disposition + containment:	
	Removal-disposition + surface controls	Partial excavation, off-site disposition, and on-site surface controls	Off-site treatment and/or landfilling; clay/soil, pavement, geomembrane, or multi-layer system

TABLE 2
PRELIMINARY SCREENING OF PROCESS OPTIONS FOR SOIL REMEDIATION

General Response Action	Remedial Technology	Process Options	Description		Screening Based on Technical Implementability
No further action	None	Not applicable	No action	(Alternative 1)	Presented as baseline case.
Access restrictions	Fencing	Fencing	Restrict access to the site by installing fencing. Regulatory agency will require deed restriction.		Potentially applicable.
Containment	Surface controls	Clay / soil	Place imported fill and/or compacted clay layer over area.		Potentially applicable.
		Pavement	Install pavement section over area.	(Alternative 2)	Potentially applicable.
In-situ treatment On-site treatment	Chemical treatment	Fixation/solidification	Excavate and blend soil with stabilizing agents to form stable mass	(Alternative 3)	Potentially applicable.
		On-site solvent extraction	Extract organic contaminants using proprietary solvents in reactor	(Alternative 4)	Potentially applicable.
		On-site soil washing	Mechanical separation through washing with surfactants; requires off-site incineration of concentrated contaminants	(Alternative 5)	Potentially applicable.
	Biological treatment	In-situ biodegradation	Introduce oxygen and nutrients, and potentially specialized microorganisms, to the subsurface to facilitate biological degradation		Potentially applicable.

(continued)

TABLE 2 (continued)
PRELIMINARY SCREENING OF PROCESS OPTIONS FOR SOIL REMEDIATION

General Response Action	Remedial Technology	Process Options	Description		Screening Based on Technical Implementability
In-situ treatment On-site treatment (continued)	Thermal treatment	In-situ vitrification	Melt contaminants and soil using electric current to destroy organic compounds and immobilize inorganic ones, converting contaminated soil into a glass and microcrystalline residual product	(Alternative 6)	Potentially applicable.
		On-site infrared desorption	Soil is heated under vacuum using infrared heating elements, resulting in desorption of contaminants from soil		Potentially applicable.
Removal Off-site treatment Disposal	Thermal treatment	Off-site incineration	Excavate and incinerate contaminated soils at an off-site facility	(Alternative 7)	Potentially applicable.
	Chemical treatment	Off-site fixation/solidification	Excavate and blend soil with stabilizing agents to form stable mass		Potentially applicable.
	Disposal	Off-site landfill	Dispose of excavated contaminated soils at an off-site landfill	(Alternative 8)	Potentially applicable.
Focused removal/ disposition + containment	Partial excavation, off-site disposition, and on-site surface controls	Off-site treatment and/or landfilling; on-site clay/soil, pavement, geomembrane, or multi-layer system	Focused removal of shallow hot spots; off-site disposition of excavated soils at permitted treatment facility and/or landfill; capping and/or other on-site surface controls	(Alternative 9)	Potentially applicable.

TABLE 3
EVALUATION OF PROCESS OPTIONS FOR SOIL REMEDIATION

General Response Action	Remedial Technology	Process Options		Effectiveness	Implementability	Cost
No further action	None	Not applicable	(Alternative 1)	Low	Low.	None.
Access restrictions	Fencing	Fencing		Low.	High. Easily implemented. Deed restriction likely.	Low.
Containment	Surface controls	Clay / soil		Moderate to high. Prevents direct and dust exposure. Reduces surface water infiltration.	High. Easily implemented and maintained. Deed restriction likely.	Low.
		Pavement	(Alternative 2)	Moderate to high. Prevents direct and dust exposure. Reduces surface water infiltration.	High. Easily implemented and maintained. Deed restriction likely.	Low.
In-situ treatment On-site treatment	Chemical treatment	Fixation/solidification	(Alternative 3)	Moderate to high.	High. Requires treatability study.	Moderate.
		On-site solvent extraction	(Alternative 4)	Moderate to high. Requires off-site incineration of extraction concentrate.	Moderate to high. Requires more geotechnical data and treatability study.	Moderate to high.
		On-site soil washing	(Alternative 5)	Low to moderate. Requires additional treatment and off-site disposal.	Moderate to high. Requires treatability study.	Moderate to high.

(continued)

TABLE 3 (continued)
EVALUATION OF PROCESS OPTIONS FOR SOIL REMEDIATION

General Response Action	Remedial Technology	Process Options		Effectiveness	Implementability	Cost
In-situ treatment On-site treatment (continued)	Biological treatment	In-situ biodegradation		Low to moderate. Difficulty maintaining appropriate conditions in fine soils. Uncertain success with PCBs.	Low to moderate. Requires treatability study.	Moderate.
	Thermal treatment	In-situ vitrification	(Alternative 6)	Moderate. Actual effectiveness depends on treatability study. May not be effective with fine soils.	Moderate. Requires treatability study.	Moderate to high.
		On-site infrared desorption		Moderate. Actual effectiveness depends on treatability study.	Moderate. Requires treatability study. No permitted unit	Moderate to high.
Removal Off-site treatment Disposal	Thermal treatment	Off-site incineration	(Alternative 7)	High.	Moderate to high.	High.
	Chemical treatment	Off-site fixation/solidification		High.	High.	Moderate.
	Disposal	Off-site landfill	(Alternative 8)	High. May require stabilization.	High.	Moderate.
Focused removal/ disposition + containment	Partial excavation, off-site disposition, and on-site surface controls	Off-site treatment and/or landfilling; on-site clay/soil, pavement, geomembrane, or multi-layer system	(Alternative 9)	High. May require stabilization.	High.	Moderate.

TABLE 4
EVALUATION OF REMEDIAL ACTION ALTERNATIVES

Alt. No.	Alternative Designation	Evaluation Comments		
		Effectiveness	Implementability	Estimated Cost
1	No further action	Existing fence controls Site access. Does not control infiltration. No reduction of long-term risk to human health and the environment	This alternative is unlikely to be accepted by the regulatory agency.	None.
2	Surface Controls	Pavement cap prevents direct and dust exposure. Reduces surface water infiltration.	Easily implemented and maintained. Deed restriction likely.	$60,000 to $80,000
3	Chemical Fixation	Reduces mobility. Effectiveness depends on the results of a treatability study. Hydrocarbons may interfere with fixation process and additional treatment would be required.	Requires treatability study. Uncertain whether treated soils may be used as backfill or require off-site disposal.	$160,000 to $180,000
4	Solvent extraction	Achieves volume reduction by concentrating PCBs. Requires feasibility study to gauge effectiveness; not proven in soils similar to those at the Site. Requires off-site incineration of PCB extraction concentrate.	Requires more geotechnical data and treatability study. Technology not sufficiently demonstrated in conditions similar to those at the Site.	$780,000 to $900,000
5	Soil washing	Achieves volume reduction by concentrating PCBs, but does not affect metals. A portion of the treated soil could be used as backfill, but the rest requires off-site disposal at a Class I landfill, probably after stabilization for metals.	Requires treatability study. Requires the use of several additional technologies, resulting in increased treatment and labor costs. Cost estimate may vary greatly depending on effectiveness demonstrated in treatability study.	$350,000 to $400,000

TABLE 4 (continued)
EVALUATION OF REMEDIAL ACTION ALTERNATIVES

Alt. No.	Alternative Designation	Evaluation Comments		
		Effectiveness	Implementability	Estimated Cost
6	In-situ vitrification	Reduces mobility and destroys organic compounds. Requires collection and treatment of off-gases. Actual effectiveness depends on treatability study.	Requires treatability study.	$590,000 to $680,000
7	Incineration	Destruction of 99.9999% of PCBs in permitted TSCA incinerator. No mobile units available.	Lack of a permitted mobile unit requires transportation out state for treatment, resulting in very high transportation and disposal costs.	$1.7 million to $3 million
8	Off-site disposal	Proven technology. May require stabilization or other treatment for metals prior to disposition.	Easily implemented. Deed restriction likely.	$450,000 to $560,000
9	Partial excavation and off-site disposition with on-site surface controls	Combines effective disposal technology, which may require stabilization for metals, with on-site controls to reduce infiltration of surface water and prevent direct and dust exposure.	Easily implemented. Deed restriction likely.	$520,000 to $650,000

APPENDIX

APPLICABLE OR RELEVANT AND APPROPRIATE REGULATIONS

(ARARS)

TABLE A-1 FEDERAL ARARS					
Requirements	**Comments**	**Alternatives**	**A**	**RAA**	**TBC**
I. CONTAMINANT SPECIFIC					
A. Clean Air Act (CAA) (42 U.S.C. §§ 7401-7642) (40 CFR 50-69)	National primary and secondary ambient air quality standards (NAAQS) are defined under Section 109 of the CAA and are listed in 40 CFR 50. Air pollutants that may be of concern at the Site are listed below along with primary NAAQS standards. • SO_2 (annual - 0.03 ppm) (24-hour - 0.14 ppm) (3-hour - 0.5 ppm) • CO (8-hour - 9 ppm) (1-hour - 5 ppm) • NO_2 (annual - 0.053 ppm) • PM_{10} (particulate matter, (10μm diameter or less)) (annual - 50 μg/m^3) (24-hour - 150 μg/m^3) • O_3 (1-hour - 235 μg/m^3) • Lead (quarterly average - 1.5 μg/m^3) Implementation of the RAP for the Site is not likely to result in classification as a "major source" under the CAA because emissions are unlikely to reach 100 tons per year of the pollutants for which the area is designated non-attainment. Therefore, this requirement is not applicable nor relevant and appropriate.	2,3, and 9	No	No	No
B. Toxic Substances Control Act (TSCA) (15 U.S.C. § 2601 <u>et seq.</u>) (40 CFR 761 <u>et seq.</u>)	TSCA regulations govern cleanup and management of PCB containing materials and wastes. The EPA recently proposed revisions to the PCB Spill Policy and some management regulations for PCB waste generated from remediation activities which may become applicable by the time remediation is initiated at the Site (59 Fed. Reg. 62788; 12/6/94). The proposed changes provide a more flexible approach and less stringent management requirements for PCB waste; thus, the status of this rule should be reviewed just prior to initiating remediation. Relevant proposed changes are included. Although generally excluded from RCRA, PCBs are also regulated as hazardous waste under the California Hazardous Waste Control Act (HWCA). Regulation of PCBs under TSCA may overlap with regulation under HWCA. RCRA regulations apply only to liquid wastes containing PCBs.	(see next page)			

A = Applicable
RAA = Relevant and Appropriate
TBC = To Be Considered

TABLE A-1 FEDERAL ARARS					
Requirements	**Comments**	**Alternatives**	**A**	**RAA**	**TBC**
1. Cleanup of PCB Spills (40 CFR 761.125)	The current PCB Spill Policy (52 Fed. Reg. 10688 4/2/87) establishes requirements for the cleanup of materials containing PCBs at concentrations greater than 50 ppm or greater, including materials which the EPA requires to be assumed 50 ppm or greater (i.e., untested mineral oil dielectric fluid). This policy is generally applicable to spills occurring on or after May 4, 1987; this exclusion does not apply to spills which may pose a greater risk, i.e., "excluded" spills. Excluded spills include spills which may contaminate surface water, groundwater, or at locations which have a high potential for human exposure. Spills of materials less than the threshold 50 ppm concentration level or occurring before May 4, 1987 are excluded; therefore, cleanup levels are established at the discretion of EPA Region IX staff. "Low-concentration spills" (materials with between 50 to 499 ppm PCBs) and less than 1 pound of PCBs by weight or less than 270 gallons of untested mineral oil are to have soil excavated to achieve soil concentrations of less than or equal to 1 ppm by weight and replaced with clean backfill (less than 1 ppm). For "high-concentration spills" or low-concentration spills exceeding 1 pound of PCBs or 270 gallons of untested mineral oil, the default cleanup concentrations are 25 ppm by weight. An alternative cleanup level of 50 ppm by weight may be used if the responsible party places a readily visible notice in the area identifying it as contaminated with PCBs. However, the EPA at its discretion may recommend lower cleanup levels using site-specific potential for human exposure. The proposed changes to the Spill Policy seek to harmonize the CERCLA, RCRA and TSCA cleanup goals by using a uniform risk-based approach for determining appropriate "clean closure" cleanup levels. Spills occurring before April 18, 1978 would be presumed to be "disposed in a manner which does not present a risk." No cleanup would be warranted unless EPA found there is a risk of exposure. If a potential for exposure was determined, then a risk-based approach based upon site-specific exposure factors could be used to determine if cleanup is necessary and if so, derive appropriate cleanup values. The concentration for non-liquid PCB wastes are to be measured based upon dry-weight. The PCB Spill Policy is applicable.	2,3, and 9	No	No	Yes
2. Management and Disposal of PCB Containing Remediation Wastes (40 CFR 761.60-761.79)	Current TSCA regulated PCB-containing wastes must be managed and disposed of as described at 40 CFR 761.60-761.79. PCB containing wastes are those that exceed 50 ppm PCBs. Such materials must be disposed in a TSCA permitted incinerator, TSCA permitted high efficiency boiler, or a TSCA permitted landfill (40 CFR 671.60(a)). PCB-containing waste stored for periods of one year or more must be stored as prescribed at 40 CFR 761.65. The containers holding PCB wastes must meet the requirements set forth at 40 CFR 761.65(c)(6), which refer to DOT requirements set forth at 49 CFR 178.80, 178.82, and 178.115. Containers holding the PCB waste must be marked in accordance with 40 CFR 761.40 and 761.45 and applicable DOT regulations. TSCA PCB storage and disposal requirements are applicable to TSCA regulated wastes.	2,3, and 9	Yes	No	No

A = Applicable
RAA = Relevant and Appropriate
TBC = To Be Considered

TABLE A-1 FEDERAL ARARS					
Requirements	**Comments**	**Alternatives**	**A**	**RAA**	**TBC**
3. Transportation of PCB Containing Remediation Wastes (40 CFR 761.202-761.218)	The transport of TSCA regulated PCB-containing wastes requires the generator to prepare a manifest that is to accompany the waste with the transporter. Copies of the manifest are retained at the disposal site and are also returned to the generator to assure delivery is to the designated facility. The TSCA transportation and manifesting requirements are applicable to TSCA regulated wastes.	2,3, and 9	Yes	No	No
II. LOCATION SPECIFIC A. Resource Conservation and Recovery Act (RCRA) as amended by the Hazardous and Solid Waste Amendments (HSWA) (42 U.S.C. §§ 6901-6992) (40 CFR 260-280)	RCRA establishes standards for those generating, transporting, treating, storing, managing, and disposing hazardous waste. The California Department of Toxic Substances Control (DTSC) was granted the authority to administer its hazardous waste regulations promulgated pursuant to the California Hazardous Waste Control Law (Health & Safety Code §25100 et seq., 22 CCR 66260 et seq.) in lieu of the RCRA base program on August 1, 1992 by EPA. The HWCL and its implementing regulations are more stringent than RCRA and its regulations. Therefore, the HWCL and its regulations will generally govern the generation, transport, handling, treatment, storage, and disposal of hazardous waste. The HWCL regulations are addressed under State ARARs.	2,3, and 9	No	No	Yes
III. ACTION SPECIFIC A. Resource Conservation and Recovery Act (RCRA) as amended by the Hazardous and Solid Waste Amendments (HSWA) (42 U.S.C. §§ 6901-6992) (40 CFR 260-280)	As stated above, California was granted authority to enforce the HWCL hazardous waste program in lieu of RCRA. Non-HSWA RCRA regulations are neither applicable nor relevant and appropriate. As RCRA regulations are promulgated under the HSWA amendments, they become effective in California immediately. In the event that more stringent requirements are promulgated under RCRA, those requirements will be applicable to RCRA hazardous wastes until equally stringent requirements are promulgated under the California state authorized program.	2,3, and 9	No	No	Yes

A = Applicable
RAA = Relevant and Appropriate
TBC = To Be Considered

TABLE A-1 FEDERAL ARARS					
Requirements	**Comments**	**Alternatives**	**A**	**RAA**	**TBC**
B. Clean Water Act					
1. National Pollution Discharge Elimination System (NPDES) (33 U.S.C. § 1342) (40 CFR 122-125)	The CWA prohibits discharge of pollutants from a point source into the navigable waters of the U.S. No discharges of pollutants from point sources are planned for any alternative; therefore, this requirement is not applicable, relevant and appropriate.	2,3, and 9	No	No	No
	The State Water Resources Control Board (SWRCB) is responsible for implementing the CWA in California. On August 20, 1992, the SWRCB adopted a general stormwater discharge permit for construction activities (SWRCB Order No. 92-08-DWQ, NPDES General Permit No. CAS000002). The general permit covers discharges from construction activities such as "clearing, grading, excavation, and reconstruction of existing facilities involving removal and replacement." The EPA regulations which implement the CWA stormwater program generally exempted construction activities which caused soil disturbances of less than 5 acres. However, this size restriction was overturned and remended to EPA for further action by the Ninth Circuit Court of Appeals in <u>Natural Resources Defense Council v. EPA</u>, 996 F.2d 1292 (9th Cir. 1992). Currently, the SWRCB General Permit for Construction Activity retains the 5-acre exemption, but states that it may be revised in light of further EPA or court action. The CWA stormwater regulations are applicable to remedial activities if the disturbed area is greater than 5 acres. A Storm Water Pollution Prevention Plan and Stormwater Monitoring Plan must be completed for the site if a Stormwater Permit is necessary.	2,3, and 9	Yes	No	No

A = Applicable
RAA = Relevant and Appropriate
TBC = To Be Considered

TABLE A-2 STATE ARARS					
Requirements	**Comments**	**Alternatives**	**A**	**RAA**	**TBC**
I. CONTAMINANT SPECIFIC					
A. Hazardous Waste Control Law (HWCL) (Health and Safety Code [H&SC] Sections 25100-25395) as administered by the Department of Toxic Substances Control, (DTSC) formerly the California Department of Health Services (CDHS) under the California Code of Regulations (CCR) Title 22 Minimum Standards for Management of Hazardous and Extremely Hazardous Wastes	The HWCL has many elements that are intended to control hazardous wastes from their point of generation through accumulation, transportation, treatment, storage, and ultimate disposal. It is implemented largely through regulations under the California Code of Regulations (CCR), Title 22, Sections 66260 et seq.				
1. Identification and Categories of Hazardous Wastes (22 CCR §§ 66261.10-66261.126)	Tests for identifying hazardous characteristics are described at 22 CCR § 66261.10. If a waste is either listed or tested and found to exhibit a hazardous waste characteristic, then such wastes must be managed in compliance with the applicable hazardous waste management requirements in 22 CCR § 66260 et seq. In addition to listing and the four RCRA hazardous waste characteristics (Reactivity, Corrosivity, Ignitability, and the Toxicity Characteristics Leachate Procedure [TCLP]), the HWCL regulations have established two other tests (Total Threshold Limit Concentrations [TTLC] and Soluble Threshold Limit Concentrations [STLC]) for identifying hazardous waste. Bioassays assessing mammalian and aquatic toxicity of wastes are also used to determine whether a waste is hazardous waste under the HWCL.	2,3, and 9	Yes	No	No
B. Porter-Cologne Water Quality Control Act, Water Code (WC §§ 13000-13806) as administered by the State Water Resources Control Board (SWRCB) and the Los Angeles Water Quality Control Board					
1. Title 23	Regulations pertain to land disposal unit design and construction standards that minimize dangers to the waters of the State. Wastes are classified as hazardous, designated, non-hazardous, or inert and must be disposed of accordingly. Regulations regarding water quality protection standards are left to the Regional Water Quality Control Boards. Standards are determined by RWQCBs on a case-by-case basis based on federal Water Quality Standards and state action levels. Actions taken by public agencies to clean up pollution are exempt from the requirements of Title 23, provided that re-disposal and containment meet applicable standards to the extent feasible. The Site is not within the definition of a waste management unit, therefore, these requirements are not applicable, relevant and appropriate. The RWQCB may issue waste disposal restrictions (WDRs) for any discharge to land, including the placement of contaminated soil, which specify closure and monitoring requirements.	2,3, and 9	No	No	Yes

A = Applicable
RAA = Relevant and Appropriate
TBC = To Be Considered

TABLE A-2 STATE ARARS					
Requirements	**Comments**	**Alternatives**	**A**	**RAA**	**TBC**
II. LOCATION SPECIFIC					
A. Hazardous Waste Control Law (Health and Safety Code Section 2500 <u>et seq</u>.) as administered by DTSC under the California Code of Regulations Title 22, Standards for Management of Hazardous Wastes	Location specific regulations established under HWCL restrict the siting locations of new treatment, storage and/or disposal facilities (TSDFs). New TSDFs must not be located within 200 feet of a fault which has had a displacement in the Holocene period. No new TSDF will be constructed in any alternative; therefore, this requirement is neither applicable, relevant and appropriate.	2,3, and 9	No	No	No
	Facilities located in a 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout of any hazardous waste by a 100-year flood. Two exceptions to this rule are (1) the owner/operator can demonstrate to DTSC's satisfaction that there are procedures in effect for removing the wastes safely before the waters reach the facility, or (2) that no adverse effects on human health or the environment will result if a washout does occur. Since there are no new permanent treatment, storage, or disposal facilities proposed to be sited in any scenario, these regulations are neither applicable, relevant and appropriate.	2,3, and 9	No	No	No
B. Porter-Cologne Water Quality Act (WC §§ 13000-13806) as administered by the State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Board (RWQCB) under CCR Title 23, Chapter 15.	Chapter 15 of Title 23 CCR provides guidelines for waste management unit classification and siting. New waste management units shall have a 200-foot setback from any known Holocene earthquake fault. No new waste management units are proposed in any of the remedial alternatives; therefore this standard is neither applicable, relevant and appropriate.	2,3, and 9	No	No	No
III. ACTION SPECIFIC					
A. Hazardous Waste Control Law (Health and Safety Code Sections 25100-25395, as administered by the CDHS), under CCR Title 22: Standards for Management of Hazardous Wastes	The HWCL has many elements that are intended to control hazardous wastes from their point of generation through accumulation, transportation, treatment, storage, and disposal. It is implemented largely through regulations set forth at 22 CCR Sections 66260 <u>et seq</u>. Potential ARARs for managing non-RCRA hazardous waste may vary. 22 CCR §§ 66260.21 <u>et seq.</u>				
1. Requirements for Generators of Hazardous Waste (22 CCR §§ 66262.10-66262.70)	An owner or operator who generates hazardous waste must comply with the generator standards established under Title 22. These standards include retention of manifests, submission of manifest to CDHS within 30 days of shipment, preparation of a biennial report, and a maximum 90-day accumulation time. For on-site storage of containerized bulk waste in excess of a specified quantity accumulation time is limited to 60 days. This regulation is applicable to hazardous waste resulting from any process that generates hazardous waste; therefore, this requirement is applicable to the extent hazardous waste is generated during remediation. Although a permit is not required for storage of hazardous wastes less than 90 days, the storage requirements set forth at 22 CCR § 66262.34 are applicable to the temporary storage of hazardous waste on-site prior to off-site disposal.	2,3, and 9	Yes	No	No

A = Applicable
RAA = Relevant and Appropriate
TBC = To Be Considered

TABLE A-2
STATE ARARS

Requirements	Comments	Alternatives	A	RAA	TBC
2. Hazardous Waste Hauler Registration and Requirements for Transporters of Hazardous Waste (22 CCR §§ 66263.10-66263.46)	Generators are required to prepare a manifest for the transport of hazardous waste that is to accompany the waste with the transporter. Copies of the manifest are retained at the disposal facility and are also returned to the generator to assure delivery is to the designated facility. Hazardous waste must also be transported by a hauler registered by the State to transport hazardous waste. To the extent hazardous waste is generated and transported during remediation, the HWCA hazardous waste transportation and manifesting requirements are applicable.	2,3, and 9	Yes	No	No
3. General Operation Requirements for Facilities (22 CCR §§ 66264.1-66264.100)	General facility standards, Preparedness and Prevention Requirements, Contingency Plan and Emergency Procedures, Manifest System, and Environmental Monitoring are neither applicable, relevant nor appropriate because such operational requirements apply only to permitted facilities and the Site is not a permitted facility.	2,3, and 9	No	No	No
4. Closure and Post-closure of Permitted Facilities (22 CCR §§ 66264.110-66264.120)	Closure and post-closure standards are those that minimize the need for further maintenance, and control, minimize, or eliminate post-closure migration of hazardous waste, leachate, contaminated rainfall, or waste decomposition products to the ground or surface water or the atmosphere. These standards are not applicable, relevant nor appropriate because the Site is not a permitted treatment, storage, or disposal facility.	2,3, and 9	No	No	No
5. Containers and Tanks at Permitted Facilities (22 CCR §§ 66264.170-66264.199)	Tank systems must meet the appropriate design standards and provide for adequate containment and detection/monitoring of leaks, monitoring and inspection, and proper closure procedures. To the extent hazardous waste is generated and stored in containers or tanks, it is applicable.	2,3, and 9	Yes	No	No
6. Land Disposal					
a. Land Disposal Restrictions (22 CCR § 66268)	Prior to land disposal of hazardous wastes, all restricted hazardous waste must be treated to meet the land disposal restriction (LDR) treatment standards set forth at 22 CCR § 66268. The DTSC may issue a variance for the requirements of California non-RCRA hazardous waste LDRs for specific remediation wastes, such as soil containing PCBs. The LDR regulations are applicable to remedial activities to the extent hazardous waste is generated and land disposed.	2,3, and 9	Yes	No	No
B. Mulford-Carrell Air Resources Act (Health and Safety Code Sections 39000-44563) as implemented by the South Coast Air Quality Management District (SCAQMD)	This Act assigns responsibility for the identification of air pollutants to the DTSC and CARB. The CARB and local air pollution control districts must then develop control measures reducing emissions of the identified pollutants. Although it sets no standards, this law is applicable because it gives authority to the South Coast Air Quality Management District (SCAQMD) to regulate sources of air emissions through local rules and regulations. The following is a discussion of the applicable SCAQMD Rules and Regulations.	(see next page)			

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TABLE A-2 STATE ARARS					
Requirements	**Comments**	**Alternatives**	**A**	**RAA**	**TBC**
a. SCAQMD Regulation IV -- Prohibitory Rules	Excavation activities will generate particulates, therefore, this regulation is applicable.				
(1) SCAQMD Rule 401 - Visible Emissions	Limits visible emissions from any point source to Ringelmann No. 1, or 20 percent opacity for 3 minutes in any hour.	2,3, and 9	Yes	No	No
(2) SCAQMD Rule 402 - Nuisance	Prohibits the discharge of any material (including odorous compounds) that causes injury, or annoyance to the public, property, or business or endangers human health, comfort, repose, or safety.	2,3, and 9	Yes	No	No
(3) SCAQMD Rule 403 - Fugitive Dust	Limits onsite activities so that the concentration of fugitive dust at the property line shall not be visible at the downwind particulate concentration and shall not be more than 100 micrograms per cubic meter, averaged over 5 hours. The rule also requires every reasonable precaution to minimize fugitive dust and the prevention and cleanup of any material accidentally deposited on paved streets. Some projects may require a Dust Fugitive Control Plan.	2,3, and 9	Yes	No	Yes
(4) SCAQMD Rule 404 - Particulate Matter (Concentration)	Limits particulate emissions for given volumetric gas flow rates.	2,3, and 9	Yes	No	No
(5) SCAQMD Rule 405 - Solid Particulate Matter	Establishes allowable discharge rates for particulates.	2,3, and 9	Yes	No	No
b. SCAQMD Regulation XI -- Source Specific Standards					
(1) SCAQMD Rule 1166 - Volatile Organic Compound Emissions from Decontamination of Soil	This rule limits the emission of volatile organic compounds (VOCs) from contaminated soil. VOC contaminated soil is defined as soil which registers 50 ppm or greater of Volatile Organic Compound when measured at a distance of up to three inches from the surface with an organic vapor analyzer (calibrated as hexane) or other approved equivalent method. This rule requires that in handling VOC contaminated soil, approved equipment and Best Available Control Technology measures shall be utilized, and no spreading of soil shall result in uncontrollable evaporation of VOCs. If the soil exceeds the 50 ppm threshold, this rule is applicable. An Excavation Management Plan may be required for some projects.	2,3, and 9	Yes	No	Yes
C. California Occupational Health and Safety Act, Labor Code, §§ 6300 <u>et seq</u>. and 8 CCR §§ 330 <u>et seq</u>.	Establishes the requirements for worker safety and responsibility of employers. All employees working at a federal or state Superfund or hazardous waste facility must have adequate 40-hour OSHA training in hazardous materials management. All RAPs must include a site-specific health and safety plan as outlined in 8 CCR §5192.	2,3, and 9	Yes	No	No

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NA = Not Available

+ = Hardness dependent criteria (100 mg/L $CaCO_3$ used)

* = Insufficient data to develop criteria. Value presented in the Lowest Observed Effect Level

p/ = Proposed Criteria

C = Denotes Ceiling Limit

() = Adopted values enclosed are those for which changes are proposed.

Sources:

1. 22 CCR §66261.24(a)(1)
2. 22 CCR § 12000
3. 22 CCR § 12705
4. 22 CCR §66261.24(a)(2)
5. 29 CFR 1919.1000
6. U.S. Environmental Protection Agency, Office of Science and Technology Health and Ecological Criteria Division (May 1, 1991)